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TM 9-4933-210-13

TECHNICAL MANUAL

OPERATOR, ORGANIZATIONAL, AND DIRECT SUPPORT MAINTENANCE MANUAL
FOR
TEST SET, ELECTRONICS SYSTEM
AN/TSM-100A
(NSN 4933-01-047-3389)

This copy is a reprint which includes current pages from Change 1.

HEADQUARTERS, DEPARTMENT OF THE ARMY
NOVEMBER 1982

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D 101.11:

WARNING

SERVICING AND MAINTAINING BATTERIES. Remove battery vent cover on outside of AN/TSM-115A shelter before operating the AN/TSM-100A. The vapor from the battery electrolyte can be explosive.

WARNING

Be extremely careful when working in the vicinity of batteries when the battery case is open. Do not use uninsulated tools. Do not wear rings or watches. Metal articles will, if allowed to contact intercell links, cause severe arcing with possible injury to personnel and damage to the battery. The electrolyte used in the batteries is a caustic solution of potassium hydroxide. Use normal precautions to prevent the solution from coming in contact with any part of the body. If the electrolyte gets on the skin, wash the affected areas with large quantities of water, then neutralize with a 3 percent solution of acetic acid, vinegar, or lemon juice. If electrolyte gets into the eyes, flood with water and wash eyes with a 3 percent solution of boric acid or a weak solution of vinegar; seek immediate medical attention. The vapor from this electrolyte can be explosive. Extinguish any cigarettes or open flames in the vicinity of the batteries before removing cell caps.

WARNING

The battery must be discharged before disassembly or severe burns may result from arcing.

WARNING

DRY CLEANING SOLVENT

Dry cleaning solvent or mineral spirits paint thinner is flammable and should not be used near an open flame. Fire extinguishers should be provided when these materials are used. Use only in well-ventilated areas.

CHANGE }
NO. 1 }

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 18 April 1985

OPERATOR, ORGANIZATIONAL, AND DIRECT SUPPORT MAINTENANCE MANUAL

FOR

TEST, SET, ELECTRONICS SYSTEM

AN/TSM-100A

(NSN 4933-01-047-3389)

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Remove pages	Insert pages
i and ii	i and ii
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vii and viii	vii and viii
1-9 and 1-10	1-9 and 1-10
1-13 through 1-16	1-13 through 1-16
1-19 and 1-20	1-19 and 1-20
2-19 through 2-22	2-19 through 2-22
3-39 through 3-42	3-39 through 3-42
6-5 through 6-10	6-5 through 6-10
6-21 and 6-22	6-21 and 6-22
6-35 and 6-36	6-35 and 6-36
6-41 through 6-46	6-41 through 6-46
6-53 through 6-56	6-53 through 6-56
6-75 and 6-76	6-75 and 6-76
6-123 and 6-124	6-123 and 6-124
6-155 through 6-160	6-155 through 6-160
6-165 and 6-166	6-165 and 6-166
6-175 through 6-180	6-175 through 6-180
6-185 through 6-188	6-185 through 6-188
6-191 and 6-192	6-191 and 6-192
6-195 and 6-196	6-195 and 6-196
6-199 and 6-200	6-199 and 6-200
6-205 and 6-206	6-205 and 6-206
6-209 through 6-212	6-209 through 6-212
6-215 and 6-216	6-215 and 6-216
6-223 and 6-224	6-223 and 6-224

Remove pages	Insert pages
6-227 through 6-230	6-227 through 6-230
6-233 and 6-234	6-233 and 6-234
6-241 and 6-242	6-241 and 6-242
6-245 and 6-246	6-245 and 6-246
6-251 through 6-254	6-251 and 6-254
6-259 and 6-260	6-259 and 6-260
8-1 through 8-10	8-1 through 8-10
8-39 through 8-42	8-39 through 8-42
9-1 through 9-6	9-1 through 9-6
C-7 through C-10	C-7 through C-10
FO-5 (Sheets 1 and 2)	FO-5 (Sheets 1 and 2)
FO-7 (Sheets 2 through 5)	FO-7 (Sheets 2 through 5)
FO-9 (Sheet 1)	FO-9 (Sheet 1)
FO-10 (Sheets 1, 3 and 4)	FO-10 (Sheets 1, 3 and 4)
FO-11 (Sheet 1)	FO-11 (Sheet 1)
FO-12	FO-12
FO-16 through FO-19	FO-16 through FO-19
FO-23	FO-23

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TECHNICAL MANUAL
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HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C. 26 November 1982

OPERATOR, ORGANIZATIONAL, AND DIRECT SUPPORT MAINTENANCE MANUAL FOR TEST SET, ELECTRONICS SYSTEM AN/TSM-100A

(NSN 4933-01-047-3389)

REPORTING OF ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publication and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, US Army Armament, Munitions and Chemical Command, ATTN: AMSMC-MAS, Rock Island, IL 61299-6000. A reply will be furnished to you.

TABLE OF CONTENTS

			Paragraph	Page
CHAPTER	1.	INTRODUCTION		
Section	I.	General	1-1	1-1
	II.	Description and Tabulated Data	1-6	1-1
CHAPTER	2.	OPERATING INSTRUCTIONS		
Section	I.	Operating Instructions	2-1	2-1
Section	II.	Operating Under Unusual Conditions		2-32
CHAPTER	3.	FUNCTIONING OF EQUIPMENT	2-1	2-1
Section	I.	AN/TSM-100 Electronics System Test Set Analysis	3-1	3-1
Section	II.	AN/TSM-100 Functioning of Equipment	3-3	3-2
Section	III.	AN/TSM-100 Circuit Card and Component Board Assemblies Functional Analysis	3-11	3-36
CHAPTER	4.	OPERATOR/CREW MAINTENANCE INSTRUCTIONS	4-1	4-1
CHAPTER	5.	ORGANIZATIONAL MAINTENANCE INSTRUCTIONS		5-1
CHAPTER	6.	DIRECT SUPPORT MAINTENANCE INSTRUCTIONS		
Section	I.	Service Upon Receipt of Materiel	6-1	6-1
Section	II.	Prembarkation	6-3	6-4
Section	III.	Test and Troubleshooting Panel Assemblies	6-4	6-4
Section	IV.	Test and Troubleshooting Circuit Card Assemblies	6-13	6-190

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*This manual supersedes TM 9-4933-210-13, 14 April 1977.

			Paragraph	Page
Section	V.	Test and Troubleshooting Accessory Equipment	6-23	6-251
	VI.	Test and Troubleshooting Test Cable Assemblies	6-24	6-251
	VII.	General Maintenance	6-25	6-257
	VIII.	Removal and Installation of Major Components and Assemblies	6-31	6-266
CHAPTER	7.	REPAIR INSTRUCTIONS		
Section	I.	General	7-1	7-1
	II.	Repair of AN/TSM-100	7-3	7-1
	III.	Repair of Circuit Card Assemblies	7-15	7-24
CHAPTER	8.	MAINTENANCE OF AUXILIARY EQUIPMENT		
Section	I.	Repair of Accessory Equipment	8-1	8-1
	II.	Repair of Cable Assemblies	8-2	8-1
CHAPTER	9.	FINAL INSPECTION		
Section	I.	General	9-1	9-1
	II.	Final Inspection Checks	9-2	9-1
APPENDIX	A.	REFERENCES		A-1
	B.	COMPONENTS OF END ITEM LIST		
Section	I.	Introduction		B-1
	II.	Integral Components of End Item		B-2
	III.	Basic Issue Items		B-2
APPENDIX	C.	MAINTENANCE ALLOCATION CHART		
Section	I.	Introduction		C-1
	II.	Maintenance Allocation Chart		C-4
	III.	Tools and Test Equipment Requirements		C-10
	IV.	Remarks		C-10
APPENDIX	D.	EXPENDABLE SUPPLIES AND MATERIALS LIST		
Section	I.	Introduction		D-1
	II.	Expendable Supplies and Materials List		D-2
INDEX				Index 1

LIST OF ILLUSTRATIONS

Figure	Title	Page
1-1.	AN/TSM-100 Electronics system test set - front view	1-3
1-2.	AN/TSM-100 cabling diagram - internal	1-11
1-3.	AN/TSM-100 accessory equipment (2 sheets)	1-13
1-4.	Test cable interconnections (2 sheets)	1-17
2-1.	Sight current generator panel 2A1A1, controls and indicators	2-2
2-2.	Distribution box panel 2A1A2, controls and indicators	2-7
2-3.	Power panel 2A1A3, controls and indicators	2-12
2-4.	Battery charger 2A1A4, controls and indicators	2-15
2-5.	Control panel 2A2A1, controls and indicators	2-17
2-6.	Servo amplifier panel 2A2A2, controls and indicators	2-19
2-7.	SCG servo test panel 2A2A6, controls and indicators	2-22
2-8.	Inverter/converter test panel 2A2A4, controls and indicators ...	2-26
3-1.	Integrated circuit modules	3-39
3-2.	Typical latch circuit	3-41
6-1.	Range and range rate outbound	6-163
6-2.	Range and range rate inbound	6-164
6-3.	Inverter 2A1A5A2 test equipment setup	6-180
6-4.	Circuit card assemblies 2A1A2A3, 2A1A2A4, 2A1A2A5, and 2A1A2A6 test equipment setup	6-207
6-5.	Typical AN/TSM-100 battery assembly	6-259
6-6.	AN/TSM-100 battery installation	6-261
6-7.	AN/TSM-100 major components, left-hand rack (2A1)	6-267
6-8.	AN/TSM-100 major components, right-hand rack (2A2)..........	6-268
6-9.	AN/TSM-100 battery and ±15 Vdc power supply major components right-hand rack (2A2)	6-273
6-10.	AN/TSM-100 battery and inverter major components, left-hand rack (2A1)................................	6-275
6-11.	AN/TSM-100 internal cable assemblies	6-276
7-1.	Sight current generator panel 2A1A1 (2 sheets)	7-3
7-2.	Electromagnet assembly	7-7
7-3.	Distribution box panel 2A1A2 (2 sheets)	7-10
7-4.	Power panel 2A1A3 (2 sheets)	7-13
7-5.	Control panel 2A2A1	7-17
7-6.	Servo amplifier panel 2A2A2	7-19
7-7.	Servo amplifier panel 2A2A2, rear view	7-21
7-8.	Servo amplifier panel 2A2A2, resistor assembly (10556462).......	7-23
7-9.	Motor load assembly 2A2A4A1, partially exploded view	7-25
7-10.	Resistor bracket assembly 2A2A4A3	7-27
7-11.	SCG servo test panel 2A2A6 (2 sheets).....................	7-28
7-12.	Inverter/converter test panel 2A2A4	7-32
7-13.	Typical access panel	7-34
8-1.	Test unit adapter CP131 (10554265)	8-2
8-2.	Test unit adapter CP131, detailed schematic	8-3
8-3.	Deleted.	8-4
8-4.	Deleted.	8-5
8-5.	Deleted.	8-6

LIST OF ILLUSTRATIONS - Continued

Figure	Title	Page
8-6.	Deleted.	8-7
8-7.	Deleted.	8-8
8-8.	Deleted.	8-9
8-9.	Test set adapter TS3 (11748235)	8-10
8-10.	Test set adapter TS3 circuit card	8-12
8-11.	Test set adapter TS3, detailed schematic	8-13
8-12.	Test set adapter TS3 circuit card, detailed schematic	8-14
8-13.	Binding post adapter CP129, detailed schematic	8-14
8-14.	SCG magnet and torque motor modules extender board assembly (10554283)	8-15
8-15.	Extender board assembly, distribution box and SCG (10554270)	8-16
8-16.	Extender board assembly, distribution box and SCG (10554271)	8-17
8-17.	Extender board assembly, AN/MWM-3 test set (8438956)	8-18
8-18.	Extender board assembly distribution box (10554267)	8-19
8-19.	Extender board assembly distribution box (10554268)	8-20
8-20.	Extender board assembly distribution box (10554291)	8-21
8-21.	Auxiliary position indicator (8438963)	8-22
8-22.	Auxiliary position indicator, detailed schematic	8-23
8-23.	Internal cable assembly W120 (10554147) wiring diagram	8-24
8-24.	Internal cable assembly W121 (10554148) wiring diagram	8-25
8-25.	Internal cable assembly W122 (10554168) wiring diagram	8-26
8-26.	Internal cable assembly W123 (10554144) wiring diagram	8-27
8-27.	Internal cable assembly W124 (10554158) wiring diagram	8-27
8-28.	Internal cable assembly W152 (11825877-1) wiring diagram	8-28
8-29.	Internal cable assembly W153 (11825877-2) wiring diagram	8-28
8-30.	Internal cable assembly W201 (11747114-1) wiring diagram	8-29
8-31.	Internal cable assembly W202 (11747114-2) wiring diagram	8-29
8-32.	Internal cable assembly W203 (11747114-3) wiring diagram	8-30
8-33.	Internal cable assembly W204 (11747114-4) wiring diagram	8-30
8-34.	External shelter power cable assembly W125 (10554160) wiring diagram	8-31
8-35.	Test cable W101 (10554021) wiring diagram	8-31
8-36.	Test cable W102 (12000051) wiring diagram	8-32
8-37.	Test cable W103 (10554023) wiring diagram	8-33
8-38.	Test cable W104 (10554024) wiring diagram	8-34
8-39.	Test cable W105 (10554025) wiring diagram	8-34
8-40.	Test cable W106 (10554026) wiring diagram	8-34
8-41.	Test cable W107 (10554027) wiring diagram	8-35
8-42.	Test cable W108 (10554028) wiring diagram	8-36
8-43.	Test cable W109 (10554029) wiring diagram	8-36
8-44.	Test cable W110 (10554030) wiring diagram	8-37
8-45.	Test cable W111 (10554031) wiring diagram	8-37
8-46.	Test cable W112 (10554032) wiring diagram	8-38
8-47.	Test cable W113 (10554033) wiring diagram	8-38
8-48.	Test cable W114 (10554034) wiring diagram	8-39
8-49.	Test cable W115 (10554045) wiring diagram	8-39
8-50.	Test cable W116 (10554046) wiring diagram	8-40

LIST OF ILLUSTRATIONS - Continued

Figure	Title	Page
8-51.	Test cable W117 (10554047) wiring diagram	8-40
8-52.	Test cable W118 (10554048) wiring diagram	8-41
8-53.	Test cable W119 (10554049) wiring diagram	8-42
8-54.	Test cable W126 (10554193) wiring diagram	8-43
8-55.	Test cable W127 (10554202) wiring diagram	8-43
8-56.	Test cable W131 (10554101) wiring diagram	8-44
8-57.	Test cable W132 (10554102) wiring diagram	8-45
8-58.	Test cable W133 (10554103) wiring diagram	8-45
8-59.	Test cable W134 (10554219) wiring diagram	8-46
8-60.	Test cable W137 (10556294) wiring diagram	8-46
8-61.	Test cable W138 (10554276) wiring diagram	8-47
8-62.	Test cable W205 (11747280) wiring diagram	8-48
8-63.	Test cable W206 (11747281) wiring diagram	8-48
8-64.	Test cable W207 (11747282) wiring diagram	8-49
8-65.	Test cable W208 (11747283) wiring diagram	8-49
8-66.	Test cable W209 (11747245) wiring diagram	8-50
8-67.	Test cable W224 (11829937) wiring diagram	8-51
8-68.	Test cable W225 (11829938) wiring diagram	8-51
8-69.	Test cable W226 (11829939) wiring diagram	8-51
8-70.	Test cable W265 (11825871-1) wiring diagram	8-51
8-71.	Test cable W266 (11825871-2) wiring diagram	8-52
8-72.	Test cable W280 (10548071) wiring diagram	8-52
8-73.	Test cable W275 (12004335) wiring diagram	8-52
FO-1.	AN/TSM-100 test set power distribution, simplified schematic	
FO-2.	AN/TSM-100 interconnecting schematic diagram	
FO-3.	Power panel 2A1A3 simplified schematic	
FO-4.	Power panel 2A1A3 and AN/TPM-22 radar test set unit 1 simplified interface schematic	
FO-5.	Power panel 2A1A3, detailed schematic (2 sheets)	
FO-6.	Sight current generator panel 2A1A1, detailed schematic (4 sheets)	
FO-7.	Distribution box panel 2A1A2, detailed schematic (8 sheets)	
FO-8.	Control panel 2A2A1, detailed schematic (2 sheets)	
FO-9.	Servo amplifier 2A2A2, detailed schematic (2 sheets)	
FO-10.	SCG servo test panel 2A2A6, detailed schematic (4 sheets)	
FO-11.	Inverter/converter test panel 2A2A4 and motor load assembly 2A2A4A1 detailed schematic (4 sheets)	
FO-12.	Power panel circuit card 2A1A3A1 (10554186) detailed schematic and component layout	
FO-13.	Sight current generator circuit card 2A1A1A1 (10554188), detailed schematic and component layout	
FO-14.	Logic function resistors circuit card 2A1A2A1 (10554163), detailed schematic and component layout	
FO-15.	Relay sense resistors circuit card 2A1A2A2 (10554184), detailed schematic and component layout	
FO-16.	Relay sense and K12 operation circuit card 2A1A2A3 (10554179), detailed schematic and component layout	
FO-17.	K6 operation and sequence circuit card 2A1A2A4 (10554185), detailed schematic and component layout	

LIST OF ILLUSTRATIONS - Continued

Title

FO-18. K8 operation and sequence circuit card 2A1A2A5 (10554164), detailed schematic and component layout ....
FO-19. K11 operation and sequence circuit card 2A1A2A6 (10554165), detailed schematic and component layout ....
FO-20. Relay time circuit card 2A1A2A7 (10554189), detailed schematic and component layout ....
FO-21. Noise suppression circuit card 2A1A2A8 (10554208), detailed schematic and component layout ....
FO-22. Servo amplifier circuit card 2A2A2A1 (11758031), detailed schematic and component layout ....
FO-23. Range and range rate generator circuit card 2A2A6A1 (11747101), detailed schematic and component layout ....
FO-24. Range D/A converter circuit card 2A2A6A2 (10548359), detailed schematic and component layout ....
FO-25. Range rate D/A converter circuit card 2A2A6A3 (10548330), detailed schematic and component layout ....

LIST OF TABLES

Number	Title	Page
1-1.	AN/TSM-100 electronics system test set, major assemblies and related subassemblies	1-4
1-2.	AN/TSM-100 cable assemblies	1-12
1-3.	AN/TSM-100 test set accessory equipment	1-15
1-4.	AN/TSM-100 test set cables	1-21
1-5.	AN/TSM-100 physical and electrical data	1-25
1-6.	Location of AN/TSM-100 identification and warning plates	1-26
2-1.	Sight current generator panel 2A1A1, list of controls and indicators	2-3
2-2.	Distribution box panel 2A1A2, list of controls and indicators	2-8
2-3.	Power panel 2A1A3, list of controls and indicators	2-13
2-4.	Battery charger 2A1A4, list of controls and indicators	2-16
2-5.	Control panel 2A2A1, list of controls and indicators	2-18
2-6.	Servo amplifier panel 2A2A2, list of controls and indicators	2-20
2-7.	SCG servo test panel 2A2A6, list of controls and indicators.	2-23
2-8.	Inverter/converter test panel 2A2A4 list of controls and indicators	2-27
2-9.	AN/TSM-100 operational checklist	2-28
3-1.	Sight current generator (SCG) panel test points	3-5
4-1.	Preventive maintenance checks and services (PMCS) procedures	4-3
6-1.	Test equipment required for AN/TSM-100 test and troubleshooting procedures	6-6
6-2.	Power panel 2A1A3, test procedures	6-7
6-3.	Power panel 2A1A3, troubleshooting procedures	6-21
6-4.	Sight current generator panel 2A1A1, test procedures	6-33
6-5.	Sight current generator panel 2A1A1, troubleshooting procedures	6-53
6-6.	Distribution box panel 2A1A2, test procedures	6-56
6-7.	Distribution box panel 2A1A2, troubleshooting procedures	6-93
6-8.	Control panel 2A2A1, test and troubleshooting procedures	6-123
6-9.	Servo amplifier panel 2A2A2 and motor load assembly 2A2A4A1, test procedures	6-128
6-10.	Servo amplifier panel 2A2A2 and motor load assembly 2A2A4A1, troubleshooting procedures	6-143
6-11.	SCG servo test panel 2A2A6 test procedure	6-149
6-12.	SCG servo test panel 2A2A6 troubleshooting procedures	6-165
6-13.	Inverter/converter test panel 2A2A4 test and troubleshooting procedures	6-172
6-14.	Inverter 2A1A5A2 test procedures	6-179
6-15.	±15 Vdc Power Supply 2A2A5A2, test procedures	6-186
6-16.	Power panel circuit card 2A1A3A1, test and troubleshooting procedures	6-192
6-17.	Sight current generator circuit card 2A1A1A1, test and troubleshooting procedures	6-197
6-18.	Logic function resistors circuit card 2A1A2A1, test and troubleshooting procedures	6-201

LIST OF TABLES - Continued

Number	Title	Page
6-19.	Relay sense resistors circuit card 2A1A2A2, test and troubleshooting procedures	6-204
6-20.	Relay sense and K12 operation circuit card 2A1A2A3, test and troubleshooting procedures	6-208
6-21.	K6 operation and sequence circuit card 2A1A2A4, test and troubleshooting procedures	6-212
6-22.	K8 operation and sequence circuit card 2A1A2A5, test and troubleshooting procedures	6-217
6-23.	K11 operation and sequence circuit card 2A1A2A6, test and troubleshooting procedures	6-221
6-24.	Relay time circuit card 2A1A2A7, test and troubleshooting procedures	6-225
6-25.	Noise suppression circuit card 2A1A2A8, test and troubleshooting procedures	6-228
6-26.	Servo amplifier circuit card 2A2A2A1, test and troubleshooting procedures	6-231
6-27.	Range and range rate generator circuit card 2A2A6A1, test and troubleshooting procedures	6-234
6-28.	Range D/A converter circuit card 2A2A6A2, test and troubleshooting procedures	6-242
6-29.	Range rate D/A converter circuit card 2A2A6A3, test and troubleshooting procedures	6-247
6-30.	Deleted.	6-252
6-31.	Test set adapter TS3 (11748235) test and troubleshooting procedure	6-254
6-32.	Maintenance efforts	6-257
6-33.	Battery charger (2A1A4) charging voltage setting versus ambient temperature	6-264
9-1.	AN/TSM-100 test set final inspection checks	9-2

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1-1. Scope.

a. Purpose of Manual. This manual is for your use in operating and maintaining the AN/TSM-100A Electronics System Test Set, its accessory equipment, and external cable assemblies. Hereafter, the AN/TSM-100A will be known as the AN/TSM-100.

b. Content Summary. This manual contains the following information:

(1) A description of the equipment.

(2) Corrective and preventive maintenance instructions.

(3) Checkout and fault isolation procedures.

(4) Repair instructions.

(5) Shipment and storage procedures.

(6) Reference to all related publications (appendix A).

(7) Maintenance allocation chart defining maintenance level responsibilities (appendix B).

(8) Complete set of detailed schematics for the AN/TSM-100 Electronics System Test Set (fig. FO-1 through FO-25).

1-2. Forms and Records. Refer to TM 38-750 for instructions on the use of appropriate forms, records, and reports.

1-3. Calibration. Calibration procedures for the AN/TSM-100 are contained in TB 9-4933-210-34.

1-4. Quality Assurance/Quality Control (QA/QC). There are no QA/QC technical manuals applicable at the direct support maintenance level.

1-5. Reporting Equipment Improvement Recommendations (EIR). EIR's will be prepared on Quality Deficiency Report (QDR). Instructions for preparing EIR's are provided in TM 38-750. The Army Maintenance Management System (TAMMS). EIR's should be mailed directly to U.S. Army Armament Materiel Readiness Command ATTN: DRSAR-MAO, Rock Island, IL 61299.

Section II. DESCRIPTION AND TABULATED DATA

1-6. Description.

a. General. The AN/TSM-100 Electronics System Test Set consists of the test set, its accesory equipment, and external test cable assemblies (test cables). The purpose of the test set is to provide a means to test, troubleshoot, and fault isolate certain electronic assemblies of the M163A1 and M167A1 Vulcan Air Defense Systems (VADS), after the assemblies have been removed from their systems. The test set is used to check out the following system assemblies:

(1) Sight current generator (SCG) assembly.

(2) Distribution box assembly.

(3) Control panel assembly.

(4) Servo amplifier assemblies.

(5) AN/MWM-3 Organizational Maintenance Test Set.

(6) Power static inverter.

(7) Power supply, Dc to Dc.

(8) Power inverter.

(9) AN/TPM-23 Organizational Maintenance Test Set.

(10) Radar system, UNIT 2.

(11) AN/VPM-2, Radar Test Set

The test panel assemblies are used to apply simulated system inputs and loads to the system assembly being checked out. Test points and indicators are provided on the test panel assemblies to monitor the operation of the assembly under test as the inputs are varied. The accessory equipment (adapters and extender boards) is used as needed to aid in the checkout and fault isolation procedures. The test cables are used to connect the system assembly being checked out to the appropriate test panel assembly in the test set. Each test panel assembly has test cable connectors on its front panel.

b. Description of AN/TSM-100. The AN/TSM-100 is normally located in the shelter-mounted AN/TSM-115A hereafter referred to as AN/TSM-115 electronic test and repair shop. In addition to the AN/TSM-100, designated UNIT 2, the shelter contains an AN/TPM-22A, hereafter referred to as AN/TPM-22 Radar Test Set, designated UNIT 1. The AN/TSM-100, (fig. 1-1), is a console comprised of two cabinet-type racks (2A1 and 2A2). The left-hand rack (2A1) contains a sight current generator test panel assembly (2A1A1), a distribution box test panel assembly (2A1A2), a power panel assembly (2A1A3), a battery charger (2A1A4), and a battery and inverter assembly (2A1A5). The right-hand rack (2A2) contains a control panel test panel assembly (2A2A1), a servo amplifier test panel assembly (2A2A2), a counter (2A2A3), a SCG servo test panel assembly (2A2A6), inverter/converter test panel and motor load assembly and tachometer chassis (2A2A4) and a battery and ±15 Vdc power supply assembly (2A2A5). The major components of the test set are connected through nine internal cable assemblies. The AN/TSM-100 is also connected to the AN/TPM-22 Radar Test Set (UNIT 1). A single external cable assembly (W125) connects the AN/TSM-100 to the shelter power. Table 1-1 lists the major assemblies and related subassemblies of the AN/TSM-100 by reference designation.

(1) Sight Current Generator Panel 2A1A1. The sight current generator test panel assembly is used to check out and fault isolate the system sight current generator (SCG) assembly. Seven test cable connectors are provided on the front of the test panel assembly. These connectors mate with the test cables to the SCG under test. Various controls (switches and potentiometers), test points, and indicators provide means to simulate system SCG inputs and to monitor the SCG responses. The major subassemblies of the SCG test panel assembly are: sight current generator circuit card (2A1A1A1), magnet assembly (2A1A1A2), and torque control motor (2A1A1A3). The sight current generator circuit card contains circuitry used to test the sight cage and ready-to-fire functions of the SCG. The magnet and torque control motor assemblies are used to simulate system loads on the SCG under test. Both the magnet and torque control motor assemblies are the same as those used in the M61 lead computing sight of the systems. To provide automatic range and range rate testing of the system sight current generator, the SCG panel works in conjunction with the SCG servo test panel. The SCG panel is a drawer mounted on extension slides secured to the AN/TSM-100 with four spring-loaded fasteners. Operating power for the SCG panel is obtained from two sources; the AN/TSM-100 power panel (2A1A3) and

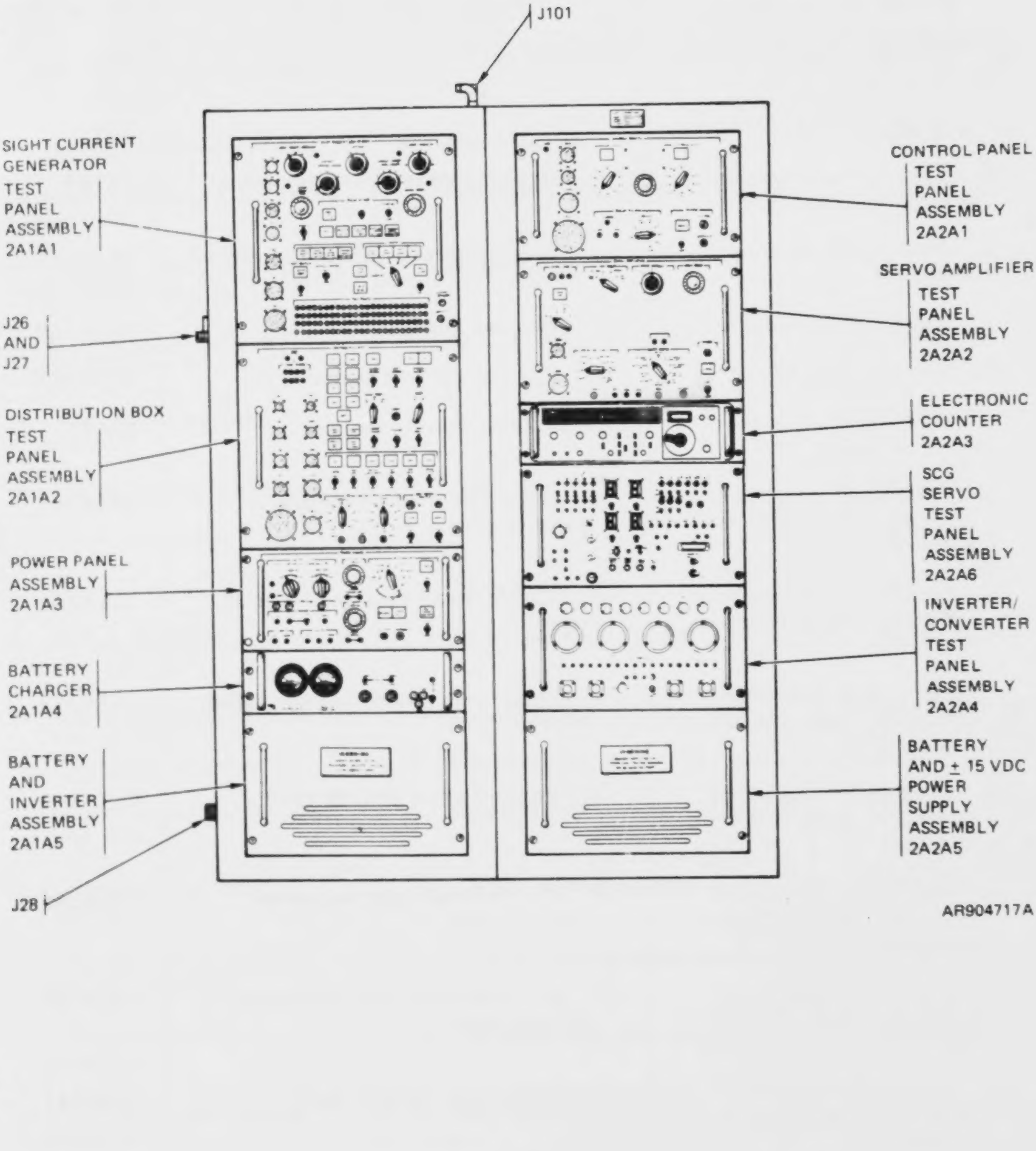

J101
SIGHT CURRENT GENERATOR TEST PANEL ASSEMBLY 2A1A1
J26 AND J27
DISTRIBUTION BOX TEST PANEL ASSEMBLY 2A1A2
POWER PANEL ASSEMBLY 2A1A3
BATTERY CHARGER 2A1A4
BATTERY AND INVERTER ASSEMBLY 2A1A5
J28
CONTROL PANEL TEST PANEL ASSEMBLY 2A2A1
SERVO AMPLIFIER TEST PANEL ASSEMBLY 2A2A2
ELECTRONIC COUNTER 2A2A3
SCG SERVO TEST PANEL ASSEMBLY 2A2A6
INVERTER/ CONVERTER TEST PANEL ASSEMBLY 2A2A4
BATTERY AND ± 15 VDC POWER SUPPLY ASSEMBLY 2A2A5
AR904717A

Figure 1-1. AN/TSM-100 Electronics System Test Set - Front View.

Table 1-1. AN/TSM-100 Electronics System Test Set, Major Assemblies and Related Subassemblies

Official nomenclature	General nomenclature	Reference designation
AN/TSM-100A Electronics System Test Set	AN/TSM-100	UNIT 2
A. Left-hand Rack		2A1
1. Sight current generator test panel assembly	1. Sight current generator panel	2A1A1
a. Electronic component assembly	a. Sight current generator circuit card	2A1A1A1
b. Range electromagnet	b. Magnet assembly	2A1A1A2
c. Torque control motor	c. Torque control motor	2A1A1A3
2. Distribution box test panel assembly	2. Distribution box panel	2A1A2
a. Electronic component assembly, logic function resistors	a. Logic function resistors circuit card	2A1A2A1
b. Electronic component assembly, logic function resistors	b. Relay sense resistors circuit card	2A1A2A2
c. Electronic component assembly, logic function resistors	c. Relay sense and K12 operation circuit card	2A1A2A3
d. Electronic component assembly, logic function resistors	d. K6 operation circuit card	2A1A2A4
e. Electronic component assembly, logic function resistors	e. K8 operation and sequence circuit card	2A1A2A5
f. Electronic component assembly, logic function resistors	f. K11 operation and sequence circuit card	2A1A2A6
g. Electronic component assembly, logic function resistors	g. Relay time circuit card	2A1A2A7

Table 1-1. AN/TSM-100 Electronics System Test Set, Major Assemblies and Related Subassemblies - continued

Official nomenclature	General nomenclature	Reference designation
h. Electronic component assembly, logic function resistors	h. Noise suppression circuit card	2A1A2A8
3. Power panel assembly	3. Power panel	2A1A3
Electronic component assembly power unit	Power panel circuit card	2A1A3A1
4. Battery charger (0 to 40 Vdc power supply)	4. Battery charger	2A1A4
5. Battery and inverter assembly	5. Battery and inverter	2A1A5
a. Left-hand battery assembly	a. Left-hand battery	2A1A5A1
b. Static power inverter	b. Inverter	2A1A5A2
B. Right-hand Rack		2A2
1. Control panel assembly	1. Control panel	2A2A1
2. Servo amplifier test panel assembly	2. Servo amplifier panel	2A2A2
Electronic component assembly	Servo amplifier circuit card	2A2A2A1
3. Electronic counter	3. Counter	2A2A3
4. Inverter/converter test panel assembly	4. Inverter/converter test panel	2A2A4
a. Inverter, converter chassis	a. Motor load assembly	2A2A4A1
b. Component mounting bracket assembly	b. Component bracket assembly	2A2A4A2
c. Resistor bracket assembly	c. Resistor bracket assembly	2A2A4A3
5. SCG servo test panel assembly	5. SCG servo test panel	2A2A6

Table 1-1. AN/TSM-100 Electronics System Test Set, Major Assemblies and Related Subassemblies - continued

Official nomenclature	General nomenclature	Reference designation
a. Digital converter	a. Range and range rate generator circuit card	2A2A6A1
b. Digital converter	b. Range D/A converter circuit card	2A2A6A2
c. Digital converter	c. Range rate D/A converter circuit card	2A2A6A3
6. Battery and ±15 Vdc power supply assembly	6. Battery and ±15 Vdc power supply	2A2A5
a. Right-hand battery assembly	a. Right-hand battery	2A2A5A1
b. Dc-dc power supply	b. ±15 Vdc power supply	2A2A5A2

the AN/TPM-22 Radar Test Set (UNIT 1). The power is applied through two connectors at the rear of the SCG panel.

(2) Distribution Box Panel 2A1A2. The distribution box panel is used to check out and fault isolate a distribution box (DB) assembly of the system. Ten test cable connectors are provided on the front of the distribution box panel to mate the assembly with cables to the DB under test. Switches, test points, and indicators are used to simulate system DB inputs and monitor the DB responses. The distribution box panel contains eight circuit card assemblies (2A1A2A1 through 2A1A2A8). Primarily, the circuit card assemblies contain logic and timing circuitry to test relay switching operations and time delays of the DB. Similar to the SCG panel (2A1A1), the distribution box panel assembly is a drawer-mounted assembly on extension slides. Operating power for the distribution box panel, distributed from the AN/TSM-100 power panel (2A1A3), is applied through a single connector at the rear of the distribution box panel.

(3) Power Panel, 2A1A3. The power panel performs two functions:

(a) The primary function of the power panel is to distribute operating voltages to the distribution box panel assemblies, battery charger (2A1A4), and counter (2A2A3) in the AN/TSM-100. In certain modes of operation, the power panel also distributes operating voltages to the AN/TPM-22 Radar Test Set (UNIT 1). The voltages distributed to the distribution box panel assemblies are interlocked, allowing only one distribution box panel to be operated at a time, except the SCG panel and the SCG servo test panel. The voltages are distributed through switches and relays in the power panel. All voltages received and distributed are routed through five connectors at the rear of the power panel.

(b) The secondary function of the power panel is to check out and fault isolate the AN/MWM-3 Organizational Maintenance Test Set. Test points are provided on the front of the power panel to allow test voltages and signals to be connected by jumper cables from the power panel to the test set under test. Controls (switches and potentiometers) and test circuitry in the power panel provide a means to generate the necessary test voltages and signals. The power panel contains a single power panel circuit card (2A1A3A1), containing a variable frequency, squarewave generator circuit for testing the test set, and arc suppression diodes for the power panel relays. The power panel is a drawer-mounted assembly on extension slides.

(4) Battery Charger, 2A1A4. The battery charger, a dc power supply, is used to keep the two AN/TSM-100 battery assemblies (2A1A5A1 and 2A2A5A1) charged. The battery charger operates on the 115 Vac shelter power distributed from the power panel (2A1A3). The battery charger output voltage (charging voltage) is routed to the power panel where it is connected in parallel across both AN/TSM-100 batteries. Controls and indicators are provided on the battery charger to allow for adjusting the charging voltage when necessary. The battery charger is mounted on rails and secured in place with four screws. Electrical connections to the battery charger are made through a barrier type terminal strip at the rear of the battery charger. Functional analysis, maintenance, checkout, fault isolation, and repair instructions for the battery charger are contained in the battery charger manual TM 9-6130-300-14 furnished with the equipment.

(5) Battery and Inverter, 2A1A5. The battery and inverter consists of two major subassemblies: left-hand battery assembly (2A1A5A1) and inverter (2A1A5A2). Both subassemblies are mounted on a support plate at the bottom of the AN/TSM-100 left-hand rack. The entire assembly is covered with a vented access panel attached to the front of the AN/TSM-100 with four spring-loaded fasteners.

(a) Left-Hand Battery, 2A1A5A1. The left-hand battery consists of one of the AN/TSM-100's two 24 Vdc nickel-cadmium batteries and its venting hose adapter. The batteries used in the AN/TSM-100 are the primary power source for operating the AN/TSM-100 and the AN/TPM-22 Radar Test Set. The batteries are connected in parallel. The 24 Vdc output is supplied to the power panel (2A1A3), where it is distributed throughout the AN/TSM-100 and to the AN/TPM-22 Radar Test Set. Both batteries have venting hose adapters on the covers. These venting adapters are provided to vent potentially hazardous gases which are generated in the batteries during charging. A T-shaped tube assembly clamps to both battery venting hose adapters and extends through a hole at the side of the AN/TSM-100. When the AN/TSM-100 is located in the AN/TSM-115 shelter, the portion of the tube assembly extending out of the side of the AN/TSM-100 is clamped to a vent tube through the wall of the shelter. This venting allows the gases to be dissipated in the outside air. The left-hand battery itself is seated in a separate tray support attached to the bottom support plate of the rack. The left-hand battery is secured to the tray support by two clevis rods that attach to the battery cover. Electrical connection to the left-hand battery is made with a quick-disconnect battery plug connector on the front of the battery.

(b) Inverter, 2A1A5A1. The inverter provides a 280-volt, peak-to-peak quasi-squarewave signal, 115 Vac, and 18 Vdc to the AN/TSM-100 power panel (2A1A3) for distribution as test voltages throughout the AN/TSM-100. The inverter is the same as the one used in the systems. The inverter mounts to the rack bottom support plate. It operates on +24 Vdc power distributed from the power panel. The inverter is operated only when its outputs are needed in a particular mode of operation of the

AN/TSM-100. Electrical connections to the inverter are made through two connectors on the front of the inverter.

(6) Control Panel, 2A2A1. The control panel is used to check out and fault isolate the system control panel assembly. Four test cable connectors are provided on the front of the control panel to mate it by test cables to the control panel under test. Switches, test points, and indicators provide means to simulate system control panel inputs and to monitor the control panel responses. The control panel components are mounted on the assembly front panel. The control panel is held in place in the test set with four spring-loaded fasteners. Operating power for the control panel, distributed from the power panel (2A1A3), is brought in through a single bracket-mounted connector on the rear of the control panel.

(7) Servo Amplifier Panel, 2A2A2. The servo amplifier panel is used with the motor load assembly (2A2A4A1) and a servo amplifier adapter. Its function is to check out and fault isolate the servo amplifier assemblies (servo amplifiers) of the system. The motor load assembly (2A2A4A1) simulates the motor load that the servo amplifier under test would drive in its system. The motor load assembly is connected to the servo amplifier under test through the servo amplifier panel. There are two test cable connectors on the front of the servo amplifier panel. These connectors are used to mate the servo amplifier panel with cables to the servo amplifier under test during checkout and fault isolation procedures. Controls (switches and potentiometers), test points, and indicators on the servo amplifier panel provide the means to simulate system servo amplifier inputs and to monitor the servo amplifier responses. The servo amplifier panel contains a single servo amplifier circuit card (2A2A2A1). The servo amplifier circuit card primarily contains the circuitry to simulate turn-on and hand control system inputs to the servo amplifier under test. The servo amplifier panel is drawer mounted on extension slides. A single connector at the rear of the servo amplifier panel is used to make connections to the servo amplifier panel, the power panel (2A1A3), and the motor load assembly (2A2A4A1).

(8) Counter, 2A2A3. The function of the counter is to provide an accurate means, within the AN/TSM-100, to measure time delay intervals and frequencies during checkout of the system's assemblies or subassemblies. Coaxial connectors are provided on the front of the counter to connect the signals being measured. A digital display provides a direct digital readout of the signals being measured. Switches and indicators are provided to select and adjust the counter mode of operation. The counter is mounted on rails within the AN/TSM-100 and secured with four screws. The counter operates on 115 Vac shelter power, distributed from the power panel (2A1A3), through a power cable plug at the rear of the counter. Functional analysis, maintenance, checkout, fault isolation, and repair instructions for the counter are contained in the counter manual (instruction manual for HP5345A/E-17) furnished with the equipment.

(9) Inverter/Converter Test Panel, 2A2A4. The inverter/converter test panel contains a motor load assembly (2A2A4A1), component bracket assembly (2A2A4A2), resistor bracket assembly (2A2A4A3), and 15 load resistors mounted on the chassis. The resistors are used as loads when testing the system power static inverter, radar set power inverter, and the ±15 Vdc power supply (converter). The motor load assembly provides a simulated system motor load for system servo amplifiers being checked out by the servo amplifier panel (2A2A2). The motor load assembly electrical inputs and outputs connect directly to the servo amplifier panel. All electrical connections between the two assemblies are made through a single bracket-mounted connector at the bottom mounting plate of the motor load assembly. A second bracket-mounted

connector is used as an aid in distributing electrical signals within the motor load assembly. The entire motor load assembly is covered by the inverter/converter test panel attached to the front of the AN/TSM-100 with four spring-loaded fasteners. Four current meters, four connectors, switches, and test jacks are mounted on the front panel. The connectors are used to mate with cables to the various units under test. The switches are used to select the proper loads for the units under test and the current meters monitor the current during testing and troubleshooting.

(a) Motor Load Assembly, 2A2A4A1. The motor load assembly consists of two motors, a tachometer, a flywheel, and associated gearing and mounting components. The motors and tachometer are the same as those used in the systems. One motor acts as a drive motor, driving the second motor, connected in the assembly to act as a generator. The drive motor receives its inputs from the servo amplifier assembly under test through the servo amplifier panel. The mechanical load on the drive motor is varied by varying the electrical load on the generator which it drives. The electrical load on the generator is varied by relay switching within the motor load assembly controlled by inputs from the servo amplifier panel. The drive motor also drives the tachometer of the assembly. The output from the tachometer is used as a feedback input to the servo amplifier panel. The drive motor and tachometer assembly mounts on the bottom mounting plate of the motor load assembly.

(b) Component Bracket Assembly, 2A2A4A2. The component bracket assembly contains the relays used to switch the electrical loads on the generator, and a component board containing calibration circuitry for the electrical loads of the motor load assembly. The component bracket assembly mounts on the left inside wall of the right-hand rack.

(c) Resistor Bracket Assembly, 2A2A4A3. The resistor bracket assembly contains the high wattage resistors used as electrical loads for the generator of the motor load assembly. The resistor bracket assembly mounts on the right inside wall of the right-hand rack.

(10) Battery and ±15 Vdc Power Supply, 2A2A5. The battery and ±15 Vdc power supply consists of two major subassemblies; right-hand battery (2A2A5A1) and ±15 Vdc power supply (2A2A5A2). Both subassemblies mount on a support plate at the bottom of the AN/TSM-100 right-hand rack. The entire assembly is covered with a vented access panel attached to the front of the test set with four spring-loaded fasteners.

(a) Right-Hand Battery, 2A2A5A1. The right-hand battery consists of the second of two 24 Vdc nickel-cadmium batteries, in the AN/TSM-100, and its venting hose adapter. This battery assembly, identical to the left-hand battery, is mounted in the same manner and performs the same functions.

(b) ±15 Vdc Power Supply, 2A2A5A2. The ±15 Vdc power supply provides +15 Vdc and -15 Vdc to the power panel (2A1A3) for distribution as test voltages. This ±15 Vdc power supply is identical to the one used in the sight current generator assembly in the systems. Two screw-driven adjustments are provided on top of the power supply for calibrating the output voltages. The power supply mounts to the bottom support plate on support brackets. The brackets mate with flanges on the sides of the power supply. The power supply operates on 18 Vdc power distributed by power panel (2A1A3). Similar to the inverter (2A1A5A2), the power supply operates only when its outputs are required in a particular mode of operation of the test set. Electrical connections to the power supply are made by means of a single connector at the bottom of the power supply.

(11) SCG Servo Test Panel, 2A2
The SCC servo test panel (2A2A6) i
primarily used in conjunction with tl
SCG panel 2A1A1 to check out and f
isolate the power series assembly of
system sight current generator. Th
SCG servo panel checks the power s
assembly of the sight current genera
The SCG servo panel contains three
circuit card assemblies that generate
simulated range and range rate data,
motor, an electrical brake, and a fan
that are used as loads when testing t
system power static inverter. The p
series assembly under test is mounte
the power series test adapter and the
mated to the test panel with a cable.
Switches and circuit card assemblies
are used to simulate system inputs an
loads. Indicators and test points on
the SCC servo test panel are provide
to monitor the operation of the power
series assembly being tested. A synchro motor on the SCG servo test pan
is used to test and align a synchro
transmitter in the AN/TPM-23 organiz
tional maintenance test set (OMTS).
The OMTS under test is mated to the
SCC servo test panel with a cable.
Test points on the SCG servo test pa
are used to monitor operation of the
AN/TPM-23 test set. High frequency
test capabilities have been included i
the SCG servo test panel to evaluate
and maintain the system tester AN/
VPM-2.

(12) AN/TSM-100 Cable Assemblie
The internal cable connections for the
test set are illustrated in figure 1-2.
Table 1-2 lists the internal cable asse
blies and the one external cable assen
bly which connects the AN/TSM-100 t
shelter power. Cable assemblies W12
through W124, W152 and W153, and W
through W204 interconnect the major c
ponents of the test set. They also pr
vide means to make external power co
nections to the test set. The 115 Vac
shelter power is brought into the test
set through cable W125 to J101 at the
top. Electrical interconnections betw
the AN/TSM-100 and AN/TPM-22 Rada
Test Set (UNIT 1) are made through

connector W121-J28 on the lower left side of the AN/TSM-100 left-hand rack. Two 24 Vdc convenience connectors (J26 and J27), part of cable assembly W122, are located on the upper left side of the AN/TSM-100 left-hand rack. Convenience connector J27 is provided so that external equipment can be connected to and operated from the two 24 Vdc batteries of the test set. J26 provides 24 Vdc during testing of the AN/TPM-23 Organizational Maintenance Test Set and AN/VPM-2 RADAR Test Set. Cables W152 and W153 provide variable output voltage from rear cable connectors of the counter to the front panel of the SCG servo test panel. Cable clamps hold the internal cables in place within the test set.

(a) Description of Accessory Equipment. The accessory equipment for the AN/TSM-100 test set is illustrated in figure 1-3. Table 1-3 lists the accessory equipment and its application and identifies the index numbers in figure 1-3. The accessory equipment consists of the adapter assemblies (adapters), extender board assemblies (extender boards), and test cable.

1. Test Unit Adapter Assembly. The test unit adapter assembly (test unit adapter) provides the primary means of applying test voltages from the AN/TSM-100 power panel (2A1A3) to the AN/MWM-3 test set during its test. The test unit adapter is a box with test points connected directly to connector pins at the ends of three cables extending from the box. In operation, the three connectors are plugged into three of the AN/MWM-3 test set connectors (fig. 1-4). The AN/TSM-100 power panel test voltages are connected with test leads to the test unit adapter test points. The test points also provide convenient points to monitor most of the AN/MWM-3 test set outputs during checkout.

NOTE: DRAWING NOT TO SCALE. RELATIVE SIZE OF ASSEMBLIES CHANGED TO SHOW INTERNAL CABLING.

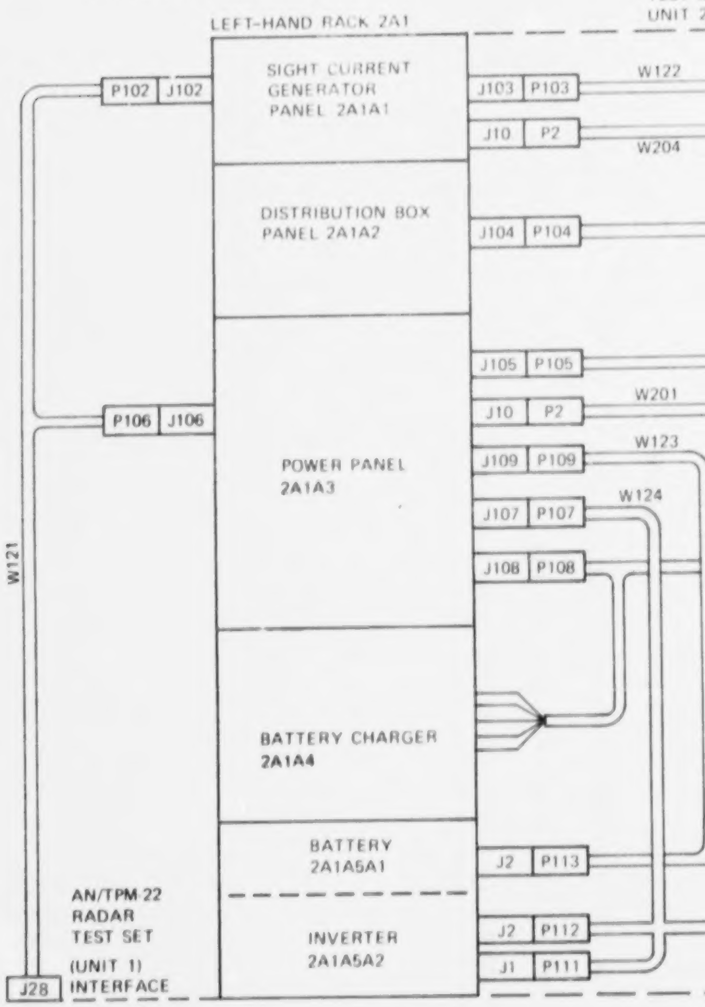
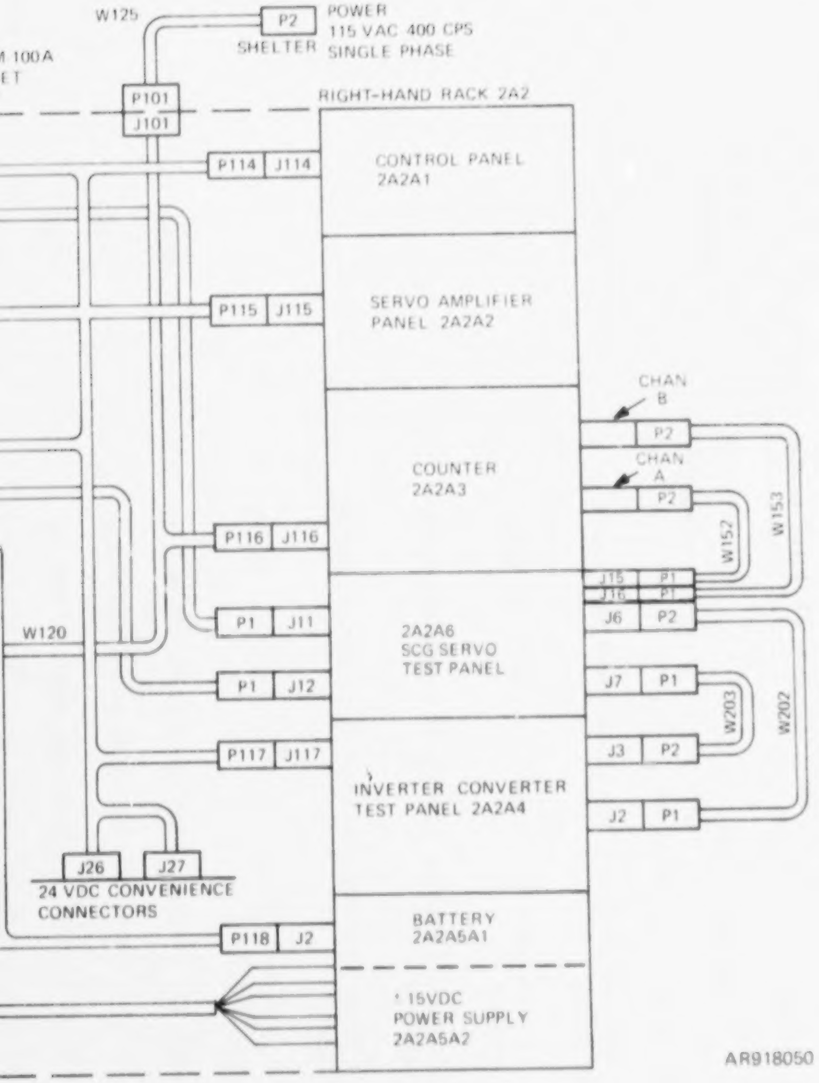

AN/TSM
TEST S
UNIT 2
LEFT-HAND RACK 2A1
SIGHT CURRENT GENERATOR PANEL 2A1A1
DISTRIBUTION BOX PANEL 2A1A2
POWER PANEL 2A1A3
BATTERY CHARGER 2A1A4
BATTERY 2A1A5A1
INVERTER 2A1A5A2
P102
J102
P106
J106
J103
P103
W122
J10
P2
W204
J104
P104
J105
P105
W201
J10
P2
W123
J109
P109
W124
J107
P107
J108
P108
J2
P113
J2
P112
J1
P111
W121
AN/TPM-22 RADAR TEST SET (UNIT 1) INTERFACE
J28

Figure 1-2. AN/TSM-


W125
P2
SHELTER
POWER
115 VAC 400 CPS
SINGLE PHASE
P101
J101
RIGHT-HAND RACK 2A2
P114
J114
CONTROL PANEL
2A2A1
P115
J115
SERVO AMPLIFIER
PANEL 2A2A2
CHAN
B
P2
CHAN
A
P2
COUNTER
2A2A3
W153
W152
P116
J116
J15
P1
J16
P1
J6
P2
P1
J11
W120
2A2A6
SCG SERVO
TEST PANEL
P1
J12
J7
P1
W203
W202
P117
J117
J3
P2
INVERTER CONVERTER
TEST PANEL 2A2A4
J2
P1
J26
J27
24 VDC CONVENIENCE
CONNECTORS
BATTERY
2A2A5A1
P118
J2
± 15VDC
POWER SUPPLY
2A2A5A2
AR918050

00 cabling diagram - internal.

Table 1-2. AN/TSM-

Nomenclature
Internal Cable Assemblies
1. Special-purpose branched electrical c assembly
2. Special-purpose branched electrical c assembly
3. Special-purpose branched electrical c assembly
4. Special-purpose branched electrical c assembly
5. Special-purpose branched electrical c assembly
6. Special-purpose electrical cable asse
7. Special-purpose electrical cable asse
8. Special-purpose electrical cable asse
9. Special-purpose electrical cable asse
10. Special-purpose electrical cable asse
11. Special-purpose electrical cable asse
External Shelter Power Cable Assembly
1. Special-purpose electrical cable asse

00 Cable Assemblies

	Reference designation
able	W120
able	W121
able	W122
able	W123
able	W124
bly	W152
bly	W153
bly	W201
bly	W202
bly	W203
bly	W204
bly	W125

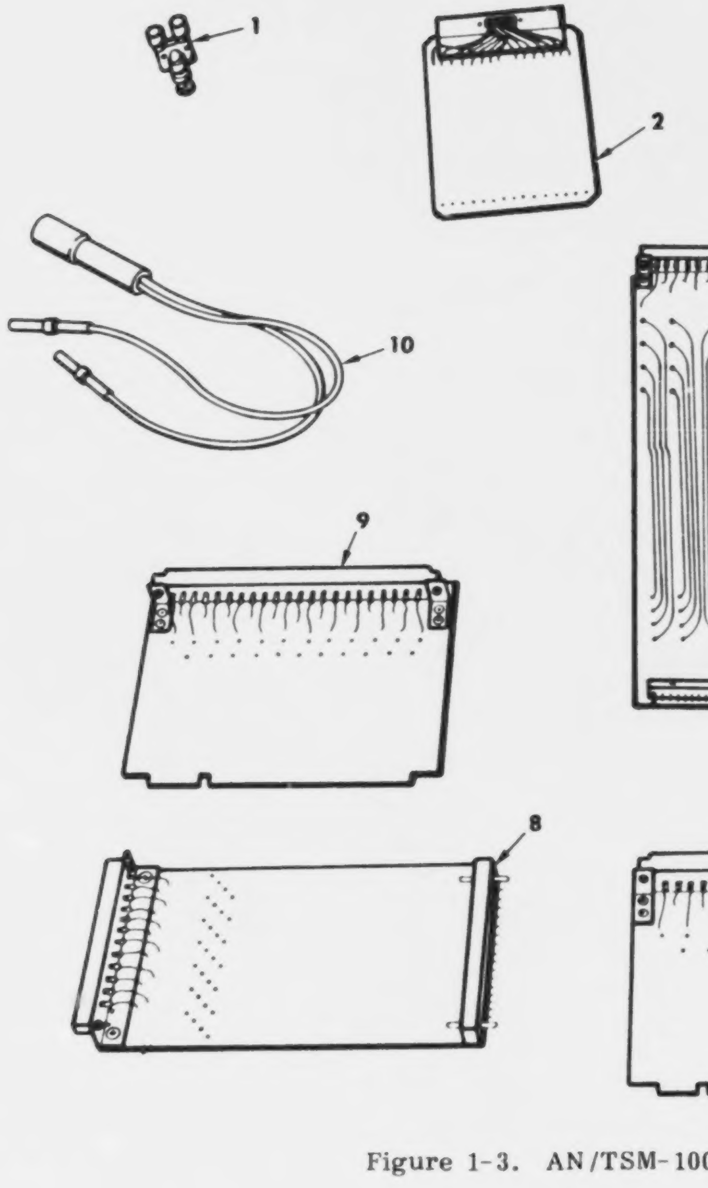
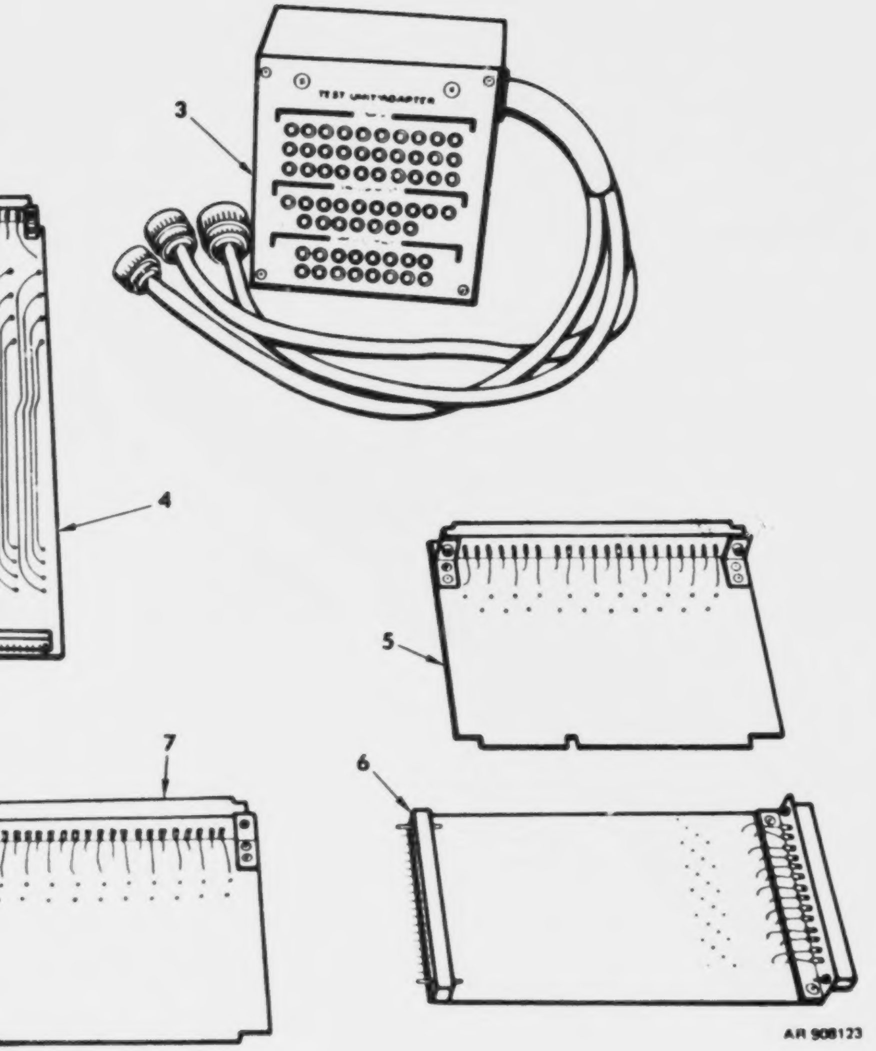


Figure 1-3. AN/TSM-10


3
TEST UNIT/ADAPTER
4
5
7
6
AR 908123

accessory equipment (sheet 1 of 2).

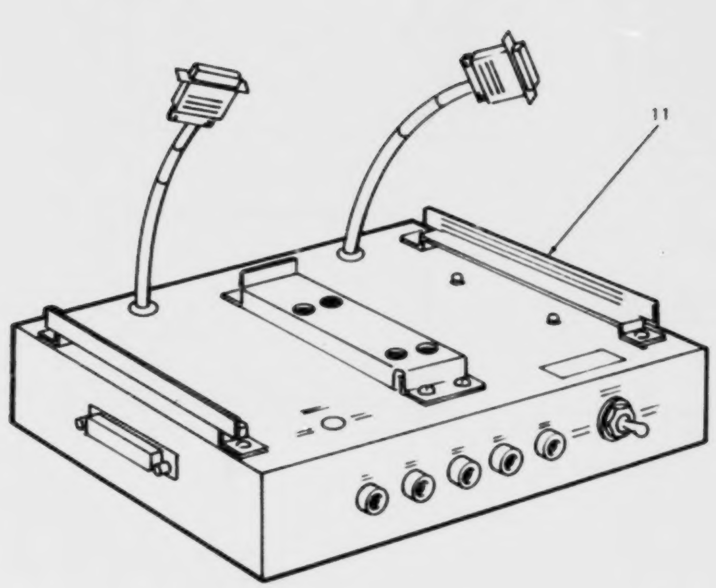
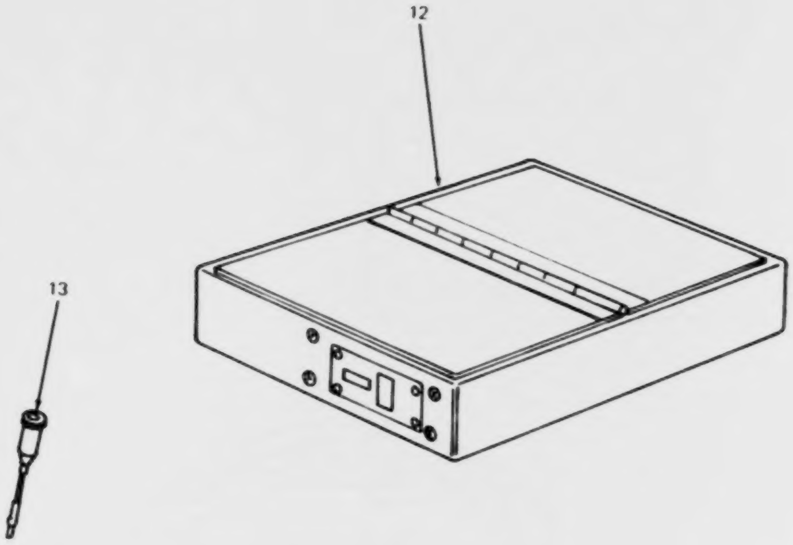


Figure 1-3. AN/TSM-100 ac



ARR82-28628

cessory equipment (sheet 2 of 2).

Table 1-3. AN/TSM-1

Nomenclature
Binding Post adapter CP129
Extender board assembly (SCG magnet and torque motor module input signals)
Test unit adapter
Extender board assembly (AN/MWM-3 Test Set)
Extender board assembly (DB)
Extender board assembly (SCG and AN/TSM-100)
Extender board assembly (DB)
Extender board assembly (SCG and AN/TSM-100)

100 Test Set Accessory Equipment

Part number	Application	Fig. 1-3 index no.
10554232	AN/TSM-100 adapter	1
10554283	Sight current generator magnet current and torque control motor current module input signal troubleshooting	2
10554265	AN/MWM-3 Organizational Maintenance Test Set test	3
8438956	AN/MWM-3 Organiizational Maintenance Test Set circuit card assemblies troubleshooting	4
10554267	Distribution box A1 circuit card assembly troubleshooting	5
10554271	Sight current generator circuit card assemblies fault isolation: AN/TSM-100 circuit card assemblies troubleshooting	6
10554268	Distribution box A2 circuit card assembly 8438346 troubleshooting	7
10554270	Sight current generator circuit card assemblies fault isolation; AN/TSM-100 circuit card assemblies troubleshooting	8

Table 1-3. AN/TSM-100 Test Set Accessory Equipment - continued

Nomenclature	Part number	Application	Fig. 1-3 index no.
Extender board assembly (DB)	10554291	Distribution box A2 circuit card assembly 8437394 troubleshooting	9
Adapter Assembly (W281)	10548076	General purpose troubleshooting	10
Test set adapter TS3	11748235	System sight current generator test A21A16	11
Auxiliary position indicator assembly	8438963	AN/MWM-3 troubleshooting	12
Adapter CP100	11728818	Power series A21A16A1 and A21A16A2 circuit card assemblies troubleshooting	13

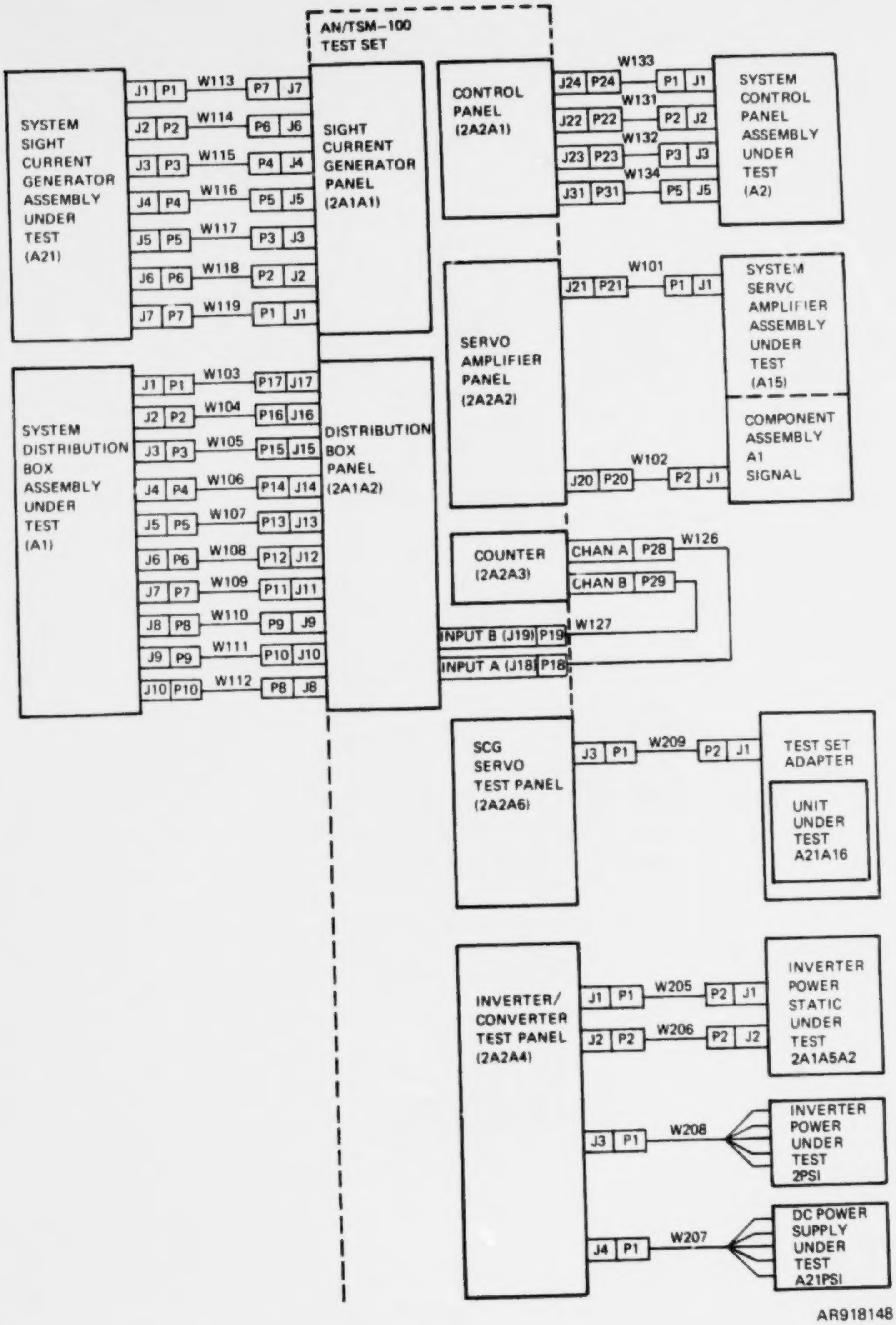

AN/TSM-100
TEST SET
SYSTEM SIGHT CURRENT GENERATOR ASSEMBLY UNDER TEST (A21)
J1 P1 W113 P7 J7
J2 P2 W114 P6 J6
J3 P3 W115 P4 J4
J4 P4 W116 P5 J5
J5 P5 W117 P3 J3
J6 P6 W118 P2 J2
J7 P7 W119 P1 J1
SIGHT CURRENT GENERATOR PANEL (2A1A1)
SYSTEM DISTRIBUTION BOX ASSEMBLY UNDER TEST (A1)
J1 P1 W103 P17 J17
J2 P2 W104 P16 J16
J3 P3 W105 P15 J15
J4 P4 W106 P14 J14
J5 P5 W107 P13 J13
J6 P6 W108 P12 J12
J7 P7 W109 P11 J11
J8 P8 W110 P9 J9
J9 P9 W111 P10 J10
J10 P10 W112 P8 J8
DISTRIBUTION BOX PANEL (2A1A2)
CONTROL PANEL (2A2A1)
J24 P24 W133 P1 J1
J22 P22 W131 P2 J2
J23 P23 W132 P3 J3
J31 P31 W134 P5 J5
SYSTEM CONTROL PANEL ASSEMBLY UNDER TEST (A2)
SERVO AMPLIFIER PANEL (2A2A2)
J21 P21 W101 P1 J1
SYSTEM SERVO AMPLIFIER ASSEMBLY UNDER TEST (A15)
J20 P20 W102 P2 J1
COMPONENT ASSEMBLY A1 SIGNAL
COUNTER (2A2A3)
CHAN A P28 W126
CHAN B P29
INPUT B (J19) P19 W127
INPUT A (J18) P18
SCG SERVO TEST PANEL (2A2A6)
J3 P1 W209 P2 J1
TEST SET ADAPTER
UNIT UNDER TEST A21A16
INVERTER/ CONVERTER TEST PANEL (2A2A4)
J1 P1 W205 P2 J1
J2 P2 W206 P2 J2
INVERTER POWER STATIC UNDER TEST 2A1A5A2
J3 P1 W208
INVERTER POWER UNDER TEST 2PSI
J4 P1 W207
DC POWER SUPPLY UNDER TEST A21PSI
AR918148

Figure 1-4. Test cable interconnections (sheet 1 of 2).

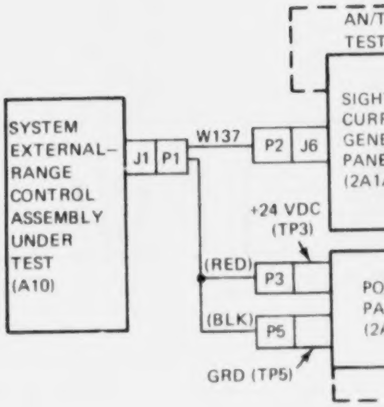
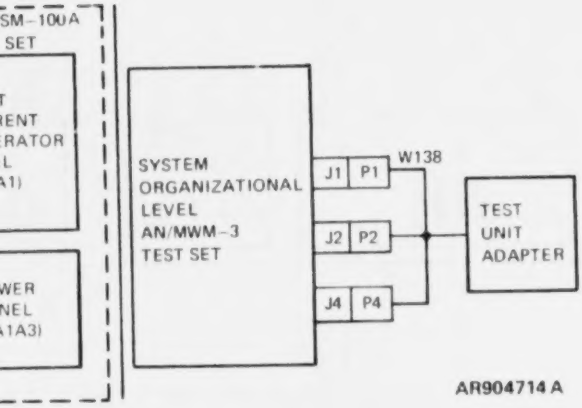

AN/T
TEST
SIGH
CURR
GENE
PANE
(2A1
SYSTEM EXTERNAL-RANGE CONTROL ASSEMBLY UNDER TEST (A10)
J1
P1
W137
P2
J6
+24 VDC (TP3)
(RED)
P3
(BLK)
P5
GRD (TP5)
PO
PA
(2A

Figure 1-4. Test Ca


SM-100A
SET
T
RENT
ERATOR
L
A1)
WER
NEL
A1A3)
SYSTEM
ORGANIZATIONAL
LEVEL
AN/MWM-3
TEST SET
J1
P1
J2
P2
J4
P4
W138
TEST
UNIT
ADAPTER
AR904714 A

ble Interconnections (sheet 2 of 2).

2. Deleted.

3. Deleted.

4. Deleted.

5. Binding Post Adapter (
The binding post adapter is used
the AN/TSM-100 to adapt a coaxia
nection to a double banana jack co
tion. One end of the adapter mat
a coaxial connector. The opposite
has two tip jacks that bring the tv
connections of the coaxial connect
as two banana jack connections.

6. Sight Current Generat
(SCG) Magnet and Torque Contro
Modules Test Point Extender Boar
Assembly. The SCG magnet and t
control motor modules test point e
ender board assembly is used du
ne SCG magnet current or torque
trol motor current module input si
troubleshooting procedures. The
tender board assembly is a printe
ircuit board with a connector at
bottom and test points at the top.

of the test points is connected to one of the connector pins. The extender board assembly mates with SCG connectors for the SCG magnet current and torque control motor current modules. In fault isolating, the extender board assembly is used with either module. The input signals of the module can be conveniently monitored at the test points of the extender board assembly. The SCG wiring continuity to and from the modules can be checked in the same manner by using the extender board assembly.

7. Sight Current Generator (SCG) and AN/TSM-100 Extender Board Assemblies. There are two SCG extender board assemblies. They are used during troubleshooting procedures for the system SCG circuit card assemblies and the AN/TSM-100 circuit card assemblies. The extender board assemblies perform identical functions and have identical configurations except that the location of the test points are on opposite sides. The position of the test points allows the extender board assemblies to be inserted side by side in an assembly and still provide access to the connector pins of an adjacent circuit card assembly. These extender board assemblies are printed circuit boards with connectors mounted at both ends, top and bottom, and test points near the top end. The top and bottom connector pins and the test points are connected in series by electrical conduction paths on the printed circuit board. In troubleshooting circuit card assemblies, the extender board assemblies allow the operating voltages of the circuit card assemblies to be monitored, or wiring continuity to the circuit card assemblies to be checked, at the extender board assembly test points. The connector on top of the extender board assembly allows the circuit card assembly to be plugged in at the top of the extender board assembly. This configuration allows the inputs and outputs of the circuit card assembly to be monitored at the extender board assembly test points. It also provides a convenient access to the extended circuit card assembly for test measurements. Either extender board

assembly can be used in any of the above ways to fault isolate any of the SCG or AN/TSM-100 circuit card assemblies.

8. AN/MWM-3 Test Set Extender Board Assemblies. There is one AN/MWM-3 test set extender board assembly. It is used in troubleshooting the AN/MWM-3 test set circuit card assemblies. The extender board assembly is a printed circuit board with top and bottom connectors and test points connected in series by electrical conduction paths on the printed circuit boards. This extender board assembly is used in the same manner as the SCG and AN/TSM-100 extender board assemblies.

9. Distribution Box (DB) Extender Board Assemblies. There are three DB extender board assemblies which are used during troubleshooting procedures for the system DB circuit card assemblies. The DB contains two circuit card assemblies, A1 and A2. Because there are two different configurations of the DB A2 circuit card assembly presently being used in the systems, two different configurations of the extender board assembly are necessary to fault isolate the DB A2 circuit card assembly. Table 1-3 identifies DB extender board usage. The extender board assemblies are printed circuit boards with a connector at the top, tab connections (identical to the DB circuit card assembly tab connections) at the bottom, and test points. Keying on the connectors tab connections is the primary difference among the three extender board assemblies. The connector, the tab connections, and test points are connected in series by electrical conduction paths on the printed circuit board. In fault isolating a DB circuit card assembly, the extender board allows operating voltages and wiring continuity to the circuit card assembly to be checked. By plugging the circuit assembly into the connector on top of the extender board, the circuit card assembly itself can be checked.

(b) Description of Test Cables. The external test cables of the AN/TSM-100 test set are listed in table 1-4 by reference designation. The primary purpose of the test cables is to connect the system assembly under test to the appropriate AN/TSM-100 test panel assembly. Some of the external test cables have other applications. Figure 1-4 shows the test cable interconnections illustrating their primary applications.

1. Test Cables W101 and W102. Test cables W101 and W102 are used with the AN/TSM-100 servo amplifier test panel assembly (2A2A2) during the testing and troubleshooting of the system servo amplifier assembly. Test cable W101 connects between the servo amplifier under test and the servo amplifier test panel assembly. Test cable W102 is used to connect the servo amplifier circuit card test connector A1J1 to the servo amplifier panel.

2. Test Cables W103 through W112. Test cables W103 through W112 are used with the distribution box panel (2A1A2) of the AN/TSM-100 during testing of the system distribution box (DB). The test cables connect the DB under test to the distribution box panel.

3. Test Cables W113 through W119. Test cables W113 through W119 are used with the SCG assembly (2A1A1) of the AN/TSM-100 during checkout of the system sight current generator (SCG). The test cables connect the SCG under test to the SCG panel. Cable W114 is also used to connect the test cable connector of the SCG panel to the W53 test cable of the AN/TPM-22 Radar Test Set (UNIT 1) during checkout procedures of the SCG magnet current module and torque control motor current module. The modules, plugged into connectors on the branched W53 test cable, are checked out by using the AN/TPM-22 Radar Test Set. Test cable W114 connects the W53 test cable (and the modules) to the magnet and torque control motor assemblies of the SCG panel to simulate system loads on the modules.

Table 1-4. AN/TSM-100 Test Set Cables

Nomenclature	Reference designation
1. Special-purpose electrical cable assembly 10554021	W101
2. Special-purpose electrical cable assembly 12000051	W102
3. Special-purpose electrical cable assembly 10554023	W103
4. Special-purpose electrical cable assembly 10554024	W104
5. Special-purpose electrical cable assembly 10554025	W105
6. Special-purpose electrical cable assembly 10554026	W106
7. Special-purpose electrical cable assembly 10554027	W107
8. Special-purpose electrical cable assembly 10554028	W108
9. Special-purpose electrical cable assembly 10554029	W109
10. Special-purpose electrical cable assembly 10554030	W110
11. Special-purpose electrical cable assembly 10554031	W111
12. Special-purpose electrical cable assembly 10554032	W112
13. Special-purpose electrical cable assembly 10554033	W113
14. Special-purpose electrical cable assembly 10554039	W114
15. Special-purpose electrical cable assembly 10554045	W115
16. Special-purpose electrical cable assembly 10554046	W116
17. Special-purpose electrical cable assembly 10554047	W117
18. Special-purpose electrical cable assembly 10554048	W118
19. Special-purpose electrical cable assembly 10554049	W119
20. Special-purpose electrical cable assembly 10554093	W126
21. Special-purpose electrical cable assembly 10554202	W127
22. Special-purpose electrical cable assembly 10554101	W131
23. Special-purpose electrical cable assembly 10554102	W132
24. Special-purpose electrical cable assembly 10554103	W133

Table 1-4. AN/TSM-100 Test Set Cables - continued

Nomenclature	Reference designation
25. Special-purpose electrical cable assembly 10554219	W134
26. Special-purpose electrical cable assembly 10556294	W137
27. Special-purpose electrical cable assembly 10554276	W138
28. Special-purpose electrical cable assembly 11747280	W205
29. Special-purpose electrical cable assembly 11747281	W206
30. Special-purpose electrical cable assembly 11747282	W207
31. Special-purpose electrical cable assembly 11747283	W208
32. Special-purpose electrical cable assembly 11747245	W209
33. Test cable 11829937	W224
34. Test cable 11829938	W225
35. Test cable 11829939	W226
36. Cable assembly radio frequency 11825871-1	W265
37. Cable assembly radio frequency 11825871-2	W266
38. Patch cable red 8438950-3	W269
39. Patch cable red 8438950-5	W271
40. Cable assembly red 8439016-1	W272
41. Cable assembly black 8439016-2	W273
42. Cable assembly 12004382	W274
43. Cable assembly 12004335	W275
44. Test lead 10548071	W280
45. Test probe cable assembly - black (quantity of 3 supplied with AN/TSM-100 test set) 10556296	W285
46. Test probe cable assembly - red (quantity of 4 supplied with AN/TSM-100 test set) 10556295	W286
47. Patch cable black 8438950-4	W287
48. Self test cable 933734	W288

4. Test Cables W126 and W127. Test cables W126 and W127 are coaxial cables with coaxial connectors at both ends of the cables. The primary purpose of the test cables is to connect the AN/TSM-100 distribution box panel (2A1A2) coaxial connectors to the AN/TSM-100 counter (2A2A3). The test cables can also be used to connect signals at the servo amplifier panel (2A2A2) coaxial connectors of the AN/TSM-100 to the counter for time-based measurements or to an oscilloscope for display purposes.

5. Test Cables W131 through W134. Test cables W131 through W134 are used with the AN/TSM-100 control panel (2A2A1) during checkout of system control panel. The test cables connect the control panel under test to the control panel.

6. Test Cable W137. The W137 test cable is a branched cable assembly with two connectors and two test probes (red and black). The test cable is used with the SCG panel (2A1A1) and power panel (2A1A3) of the AN/TSM-100 to provide a means to check out system external range control. One of the test connectors of the test cable plugs into the connector of the external range control. The other test cable connector connects to the AN/TSM-100 SCG panel, so that the simulated system loading (the magnet assembly) of the SCG panel can be used during checkout. The two test probes connect to the +24 Vdc and GRD test points of the AN/TSM-100 power panel to provide operating power for the checkout procedures.

7. Test Cable W138. Test cable W138 is used with the sight current generator adapter assembly during checkout of the AN/MWM-3 test set. The test cable connects the sight current generator adapter assembly to one of the AN/MWM-3 test set connectors. By connecting the SCG adapter assembly to the AN/MWM-3 test set in this manner, a means is provided to apply test voltages from the AN/TSM-100 power panel (2A1A3) to the AN/MWM-3 test set, through the test points on the SCG adapter assembly. This same configuration provides a convenient means to monitor connector outputs of the AN/MWM-3 test set under test at the test points of the sight current generator adapter assembly during checkout.

8. Test Cables W205 and W206. Test cables W205 and W206 are used with the inverter/converter test panel test set when testing the system inverter. Test cable W205 provides input power for the inverter and returns the 3 phase, 115 Vac output voltage. Test cable W206 returns the +19 Vdc and 208 p-p square wave voltages to the test panel.

9. Test Cable W207. Test cable W207 is used with the inverter/converter test panel test set when testing the system ±15 Vdc power supply. The test cable connects between the panel assembly and each terminal of the power ±15 Vdc supply.

10. Test Cable W208. Test cable W208 is used with the inverter/converter test panel when testing the power inverter located in Unit 2 of the AN/VPS-2 radar set. The test cable connects between the panel assembly and the terminals of the inverter.

11. Test Cable W209. Test cable W209 is used with the SCG servo test panel when testing the power series assembly of the system SCG. The test cable connects between the test panel and connector J1 of the power series test adapter.

12. Test Probe Cable Assemblies W285 and W286. There are seven test leads (four red W286, three black W285) supplied with the AN/TSM-100 test set. The test leads are single conductors with test probes at both ends. The primary purpose of the test leads is to connect the AN/TSM-100 power panel (2A1A3) test points to the test unit adapter assembly test points during checkout of

the AN/MWM-3 test set. However, the test leads can be used anywhere on the AN/TSM-100 where test points are provided.

13. Test Cables W272 through W274. Test cables W272 through W274 are used with the AN/TSM-100, when testing the Organization Test Set AN/MWM-3. The test cables are connected between various test points of the AN/MWM-3 and the AN/TSM-100.

14. Patch Cables W269, W271, and W287. Patch cables W269, W271, and W287 are used in the same manner as the test cable in paragraph 13.

15. Test Cable W275. Test cable W275 is used during troubleshooting of the distribution box panel, connecting J12 to the multimeter.

16. Test cable W280. Test cable W280 is used to activate the K27 READY TO FIRE relay circuit of the SCG panel.

17. Test Cable W288. Test cable W288 is used with the AN/TSM-100 SCG panel 2A1A1 during self test of the SCG panel. The test cable is connected between the power panel and the SCG panel. Power is applied to potentiometer in the SCG panel to test and adjust the potentiometer.

1-7. Tabulated Data. The AN/TSM-100 physical and electrical data is listed in table 1-5. The electrical power requirements of the AN/TSM-100 are separated in the table to show the ac power source from the shelter and the dc power from the AN/TPM-22 Radar Test Set (UNIT 1). The dc power requirements from the AN/TPM-22 Radar Test Set are necessary only in certain modes of operation of the AN/TSM-100.

1-8. Identification and Warning Plates

a. Identification Plates. The locations of the AN/TSM-100 identification plates are listed in table 1-6. The identification markings for the test cables and adapters are located on the cable tags. The cable tags on the adapters identify the adapter connectors and the cable connectors with which they normally mate. The test cable tags identify the test cables and their mating connectors.

b. Warning Plates. There are three warning plates on the AN/TSM-100. The warning plate locations are listed in table 1-6. Identical warning plates on storage and shipment of the AN/TSM-100 batteries are located on each of the battery access panels (fig. 1-1). The third warning plate is located over the distribution box panel FIRE VOLTS test points. This warning is necessary to warn personnel that hazardous voltages are present at the test points during certain system distribution box checkout procedures.

1-9. Repair Parts, Special Tools, TMDE and Support Equipment.

a. Special Tools and Equipment. A special insulated vent cap wrench and filling syringe are included as part of each battery assembly. The wrench and syringe are stored in the battery assemblies. Use of the wrench and syringe is described in Chapter 6, Section VII, battery maintenance. The special test equipment necessary to perform checkout/fault isolation of the AN/TSM-100 test set is described in table 6-1.

b. Spares and Repair Parts. Repair parts and special tools are contained in TM 9-4933-210-30P.

Table 1-5. AN/TSM-100 Physical and Electrical Data

1. Physical dimensions:

Height - 68.5 inches
Width - 48.0 inches
Depth - 25.5 inches
Weight - 650 pounds

2. AC power requirements:

Voltage	Frequency	Phases	Current
115 Vac	400 Hz	1	15 A

3. DC power requirements:

(AN/TPM-22 Radar Test Set, UNIT 1, power)

Voltage (Vdc)	Current (mA)
+5	250
+10	3
-10	3
+20	3
-23	250

Table 1-6. Location of AN/TSM-100 Identification and Warning Plates

Assembly	Plate nomenclature	Location
Identification plates:		
1. AN/TSM-100	TEST SET, ELECTRONICS SYS AN/TSM-100	Top front of AN/TSM-100 right-hand rack
2. Sight current generator	TEST SET, SIGHT CUR GEN TS-2660/TSM-100	Inside drawer on front of chassis
3. Distribution box panel 2A1A2	TEST SET, DB TS-2659/TSM-100	Inside top left rear of chassis
4. Power panel 2A1A3	TEST SET, POWER PNL TS-2661/TSM-100	Inside drawer on front of chassis
5. Control panel 2A2A1	TEST SET, CONT PNL TS-3657/TSM-100	Rear left side of test panel assembly front panel
6. Servo amplifier panel 2A2A2	TEST SET, SERVO AMPL TS-2658/TSM-100	Inside top rear center of test panel assembly drawer
7. SCG servo test panel 2A2A6	SCG SERVO TEST PANEL ASSEMBLY	Front center of test panel assembly front panel
8. Inverter/converter test panel 2A2A4	INVERTER/CONVERTER PANEL ASSEMBLY	Front center of test panel assembly front panel
9. Motor load assembly 2A2A4A1	INVERTER/CONVERTER CHASSIS ASSEMBLY	On top of chassis left of center at front side
Warning plates:		
10. Battery and inverter 2A1A5	WARNING REMOVE BATTERY BEFORE SHIPMENT OR INACTIVE STOWAGE OF 30 DAYS OR OVER	Front of assembly access panel

Table 1-6. Location of AN/TSM-100 Identification and Warning Plates - continued

Assembly	Plate nomenclature	Location
11. Battery and inverter 2A1A5	WARNING REMOVE BATTERY BEFORE SHIPMENT OR INACTIVE STOWAGE OF 30 DAYS OR OVER	Front of assembly access panel
12. Distribution box panel 2A1A2	WARNING FIRE VOLTS 350 VDC	Over test panel assembly front panel FIRE VOLTS test points

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. OPERATING INSTRUCTIONS

2-1. General. The controls and indicators on each of the major AN/TSM-100 assemblies are shown in figures 2-1 through 2-8. Tables 2-1 through 2-8 list the controls and indicators for each figure, except the counter (2A2A3) which is described in the manufacturer's manual.

2-2. Operating Procedures. Operating procedures using the AN/TSM-100 Electronics System Test Set to check out the Vulcan Air Defense System (VADS) are contained in the technical manual covering direct support maintenance for the VADS. Operating procedures using the AN/TSM-100 test set are contained in the following manuals:

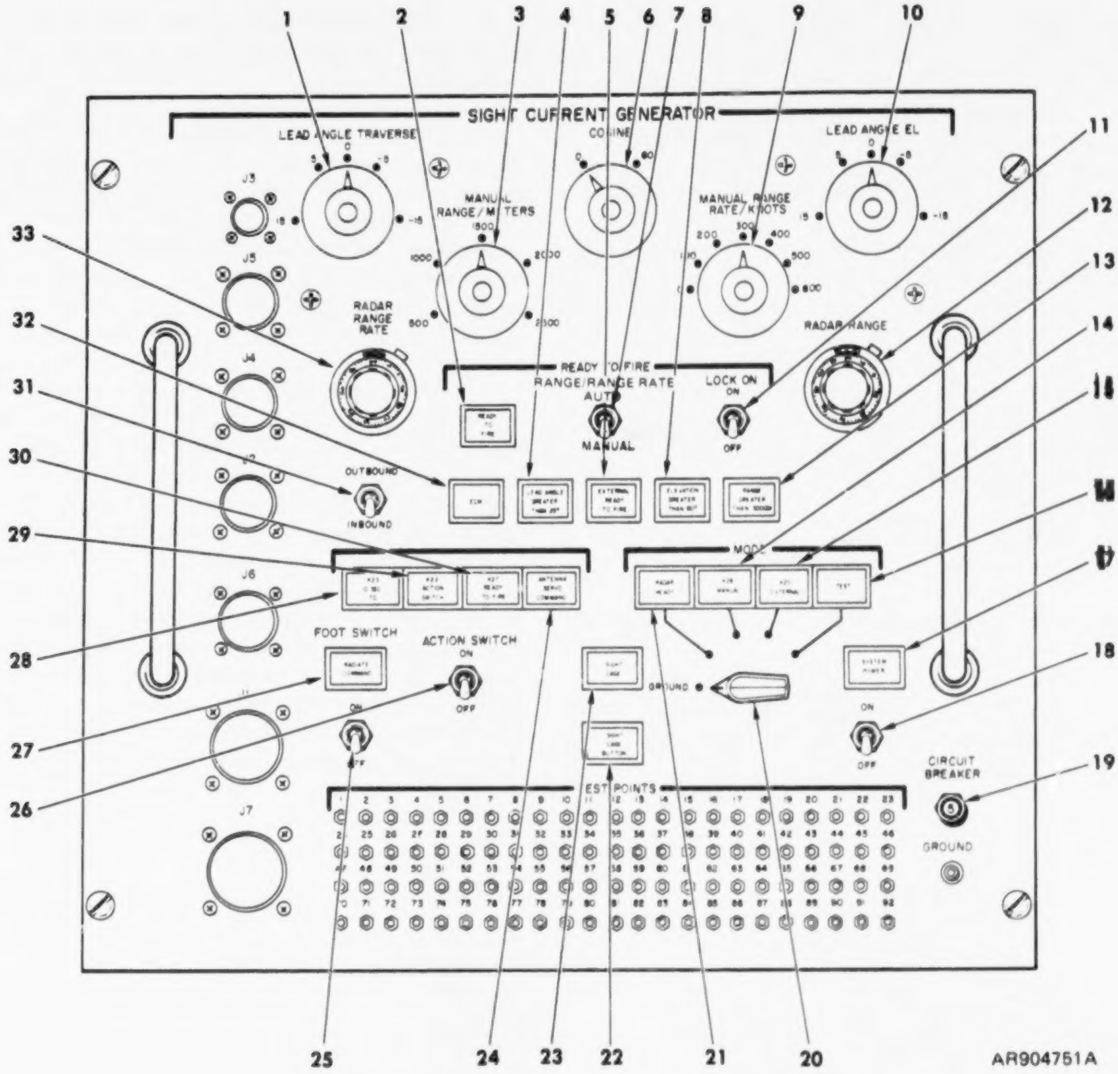
a. TM 9-2350-300-34-1 for checkout of M163A1 system.

b. TM 9-1005-286-34-1 for checkout of M167A1 system.

c. TM 9-4933-215-14&P for checkout of M163A1 and M167A1 systems organizational level AN/MWM-3 test set.

d. TM 9-1285-200-30 for checkout of the power inverter of the AN/VPS-2 radar set.

2-3. AN/TSM-100 Turn-on Procedures. Table 2-9 lists the turn-on procedures for the AN/TSM-100. The table contains turn-on procedures for each of the major assemblies of the AN/TSM-100. Prior to operating the AN/TSM-100 to check out an M163A1 or M167A1 system, refer to table 2-9 for turn-on procedures and related indications. The initial AN/TSM-100 turn-on procedures must be performed prior to turning on any of the major assemblies of the AN/TSM-100. Information from table 2-9 also can be used as a general operational check of the AN/TSM-100 by performing the steps sequentially and noting the indications. The initial turn-on procedures also should be performed prior to performing AN/MWM-3 Organizational Maintenance Test Set and power inverter checkout procedures using the AN/TSM-100 and prior to using the AN/TSM-100 when operating the AN/TPM-22 Radar Test Set (UNIT 1).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33
SIGHT CURRENT GENERATOR
LEAD ANGLE TRAVERSE
COSINE
LEAD ANGLE EL
J3
J5
J4
J2
J6
J1
J7
MANUAL RANGE/METERS
MANUAL RANGE RATE/KNOTS
RADAR RANGE RATE
RADAR RANGE
READY TO FIRE
RANGE/RANGE RATE
AUTO
MANUAL
LOCK ON
ON
OFF
OUTBOUND
INBOUND
MODE
FOOT SWITCH
ACTION SWITCH
GROUND
CIRCUIT BREAKER
TEST POINTS
AR904751A

Figure 2-1. Sight current generator panel 2A1A1, controls and indicators.

Table 2-1. Sight Current Generator Panel 2A1A1, List of Controls and Indicators.

Figure 2-1 index no.	Control or indicator	Function
1	LEAD ANGLE TRAVERSE potentiometer, R1	Provides simulated traverse lead angle signals (normally supplied by system radar antenna) to SCG under test.
2	READY TO FIRE indicator lamp, DS1	Simulates system sight READY TO FIRE light; depending upon other inputs, it will be lit or not lit.
3	MANUAL RANGE/METERS potentiometer, R2	Provides simulated manual range inputs (normally set at system control panel) to SCG under test.
4	LEAD ANGLE GREATER THAN 25° momentary action pushbutton switch, S5	When pressed, provides simulated lead angle greater than 25° signal (normally supplied by system radar antenna) to SCG under test.
5	EXTERNAL READY TO FIRE Momentary pushbutton switch, S6	When pressed, provides simulated external ready-to-fire signal (normally provided through system external range control unit) to SCG under test.
6	COSINE potentiometer, R3	Provides simulated cosine of gun elevation signals (normally supplied by system gun elevation potentiometer) to SCG under test.
7	MANUAL/AUTO toggle switch S15	Provides selection of manual or auto simulated range or range rate data input signals to SCG under test.
8	ELEVATION GREATER THAN 80° momentary action pushbutton switch, S7	When pressed, provides simulated elevation greater than 80° signal (normally supplied by system gun elevation limit switch through system DB) to SCG under test.
9	MANUAL RANGE RATE/ KNOTS	Provides simulated manual range rate inputs (normally set at system control panel) to SCG under test.
10	LEAD ANGLE EL potentiometer, R5	Provides simulated elevation lead angle signals (normally supplied by system radar antenna) to SCG under test.

Table 2-1. Sight Current Generator Panel 2A1A1, List of Controls and Indicators - Continued

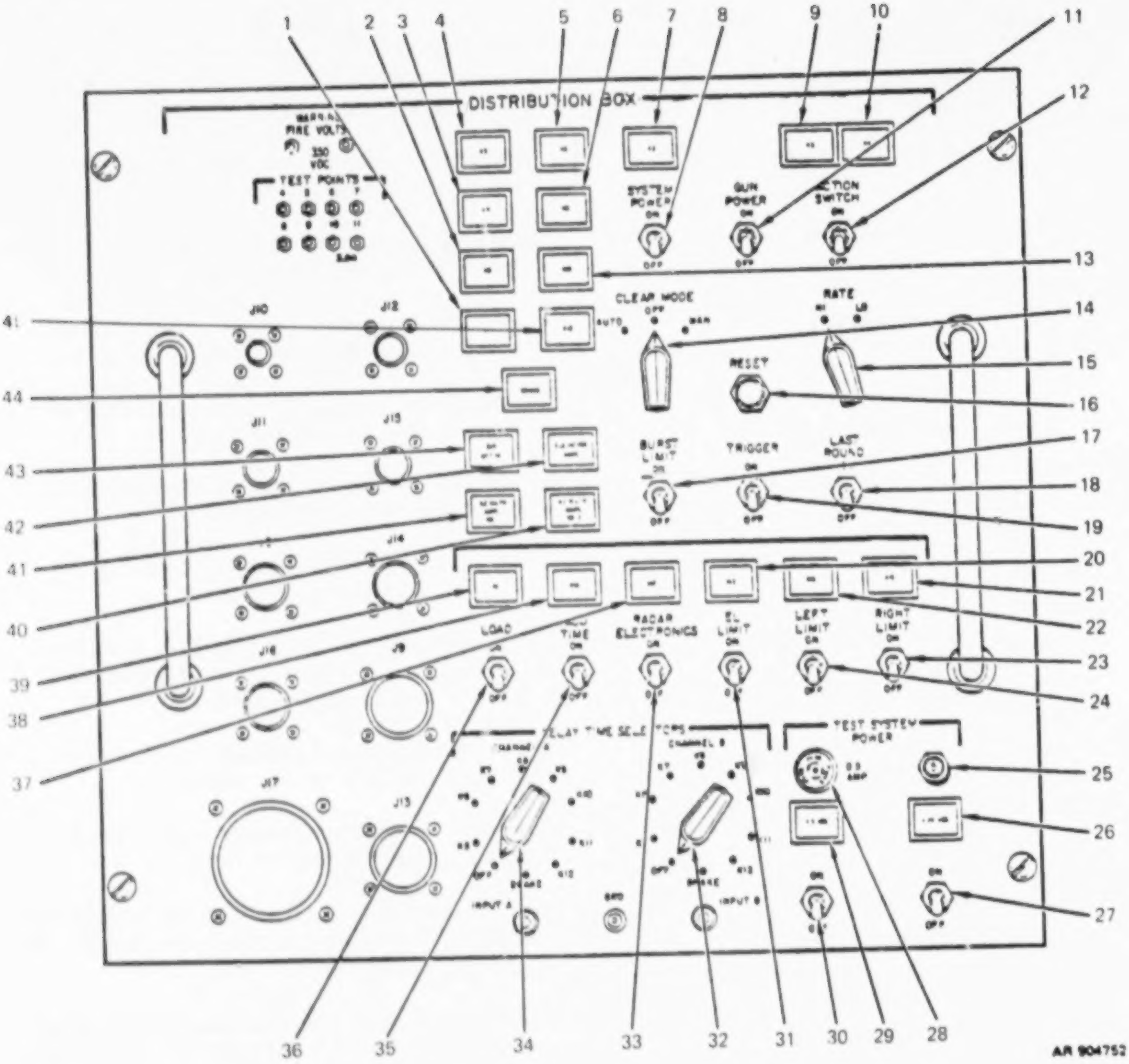
Figure 2-1 index no.	Control or indicator	Function
11	LOCK ON ON/OFF toggle switch, S2	When set to ON, provides simulated radar lock-on signal (normally supplied by system radar range computer) to SCG under test.
12	RADAR RANGE potentiometer, R7	Provides simulated radar range inputs (normally supplied by system radar range computer) to SCG under test.
13	RANGE GREATER THAN 3000M momentary action pushbutton switch, S8	When pressed, provides simulated range-greater-than 3000 M signal (normally supplied by system radar range computer) to SCG under test.
14	K26 MANUAL indicator lamp, DS7	When lit, indicates power being applied to manual mode relay K26 in SCG under test.
15	K25 EXTERNAL indicator lamp, DS8	When lit, indicates proper operation of external mode relay K25 in SCG under test.
16	TEST indicator lamp, DS9	When lit, indicates proper operation of test circuitry in SCG under test.
17	SYSTEM POWER indicator lamp, DS12	When lit, indicates 24 Vdc operating power being applied to test panel assembly.
18	SYSTEM POWER ON/OFF toggle switch, S12	When set to ON, applies 24 Vdc operating power (from test set panel assembly) to test panel assembly.
19	CIRCUIT BREAKER 5A thermal overload circuit breaker, CB1	Protects test panel assembly 24 Vdc circuitry.
20	MODE rotary switch, S11	Allows selection of operating mode (normally set at system control panel) of SCG under test. The switch positions and their functions are as follows: GROUND - No function. RADAR READY - Provides simulated radar mode operating power signal to SCG under test.

Table 2-1. Sight Current Generator Panel 2A1A1,
List of Controls and Indicators - Continued

Figure 2-1 index no.	Control or indicator	Function
		K26 MANUAL - Provides simulated manual mode operating power signals to SCG under test. K25 EXTERNAL - Provides simulated external mode operating signals to SCG under test. TEST - Provides simulated test mode operating power signals to SCG under test.
21	RADAR READY indicator lamp, DS6	When lit, indicates proper operation of radar-ready circuitry in SCG under test.
22	SIGHT CAGE BUTTON momentary action pushbutton switch, S10	When pressed, provides simulated sight-cage signal (normally set on system hand control) to SCG under test.
23	SIGHT CAGE indicator lamp DS11	When lit, indicates the presence of sight-cage current in SCG under test.
24	ANTENNA SERVO COMMAND indicator lamp, DS5	When lit, indicates proper operation of antenna-servo command circuitry in SCG under test.
25	FOOT SWITCH ON/OFF toggle switch, S13	When set to ON, provides simulated radar radiate command (normally supplied through system radiate foot switch) to SCG under test.
26	ACTION SWITCH ON/OFF toggle switch, S9	When set to ON, provides simulated action signals (normally supplied through system hand control) to SCG under test.
27	FOOT SWITCH RADIATE COMMAND indicator lamp, DS10	When lit, indicates proper operation of foot switch radiate command circuitry in SCG under test.
28	K23 10 SEC TD indicator lamp, DS2	When lit, indicates proper operation of 10-second time delay relay K23 circuitry in SCG under test.
29	K22 ACTION SWITCH indicator lamp, DS3	When lit, indicates proper operation of action switch relay K22 in SCG under test.

Table 2-1. Sight Current Generator Panel 2A1A1, List of Controls and Indicators - Continued

Figure 2-1 index no.	Control or indicator	Function
30	K27 READY TO FIRE indicator lamp, DS4	When lit, indicates proper operation of ready to fire relay K27 in SCG under test.
31	OUTBOUND/INBOUND toggle switch, S14	Provides selection of outbound (+) or inbound (-) simulated radar range rate input signals to SCG under test.
32	ECM momentary action pushbutton switch, S4	When pressed, provides simulated ECM signal (normally supplied by system radar power supply) to SCG under test.
33	RADAR RANGE RATE potentiometer, R6	Provides simulated radar range rate inputs (normally supplied by system radar range computer) to SCG under test.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38
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43
44
DISTRIBUTION BOX
WARNING FIRE VOLTS
350 VDC
TEST POINTS
SYSTEM POWER
GUN POWER
ACTION SWITCH
ON
OFF
CLEAR MODE
AUTO
MAN
RATE
HI
LO
RESET
BURST LIMIT
TRIGGER
LAST ROUND
LOAD
TIME
RADAR ELECTRONICS
EL LIMIT
LEFT LIMIT
RIGHT LIMIT
DELAY TIME SELECTORS
CHANNEL A
CHANNEL B
SPARE
INPUT A
GRD
INPUT B
TEST SYSTEM POWER
0.5 AMP
J10
J12
J11
J13
J14
J16
J9
J17
J15

AR 904752

Figure 2-2. Distribution box panel 2A1A2, controls and indicators.

Table 2-2. Distribution Box Panel 2A1A2, List of Controls and Indicators

Figure 2-2 index no.	Control or indicator	Function
1	K11 indicator lamp, DS10	When lit, indicates proper operation of relay K11 in DB under test.
2	K9 indicator lamp, DS8	When lit, indicates proper operation of relay K9 in DB under test.
3	K7 indicator lamp, DS6	When lit, indicates proper operation of relay K7 in DB under test.
4	K5 indicator lamp, DS1	When lit, indicates proper operation of relay K5 in DB under test.
5	K6 indicator lamp, DS2	When lit, indicates proper operation of relay K6 in DB under test.
6	K8 indicator lamp, DS7	When lit, indicates proper operation of relay K8 in DB under test.
7	K2 indicator lamp, DS3	When lit, indicates proper operation of relay K2 in DB under test.
8	SYSTEM POWER ON/OFF toggle switch, S6	Simulates system-power switch function (normally provided by system control panel switch) to DB under test.
9	K3 indicator lamp, DS4	When lit, indicates proper operation of relay K3 in DB under test.
10	K4 indicator lamp, DS5	When lit, indicates proper operation of relay K4 in DB under test.
11	GUN POWER ON/OFF toggle switch, S3	Simulates gun-power switch function (normally provided by system control panel switch) to DB under test.
12	ACTION SWITCH ON/OFF toggle switch S5	Simulates action switch function (normally provided through system hand control) to DB under test.
13	K10 indicator lamp, DS9	When lit, indicates proper operation of relay K10 in DB under test.
14	CLEAR MODE rotary switch, S4	Allows selection of clearing mode signals (normally applied by system control panel switch) applied DB under test. The switch positions and their functions are as follows:

Table 2-2. Distribution Box Panel 2A1A2, List of Controls and Indicators - Continued

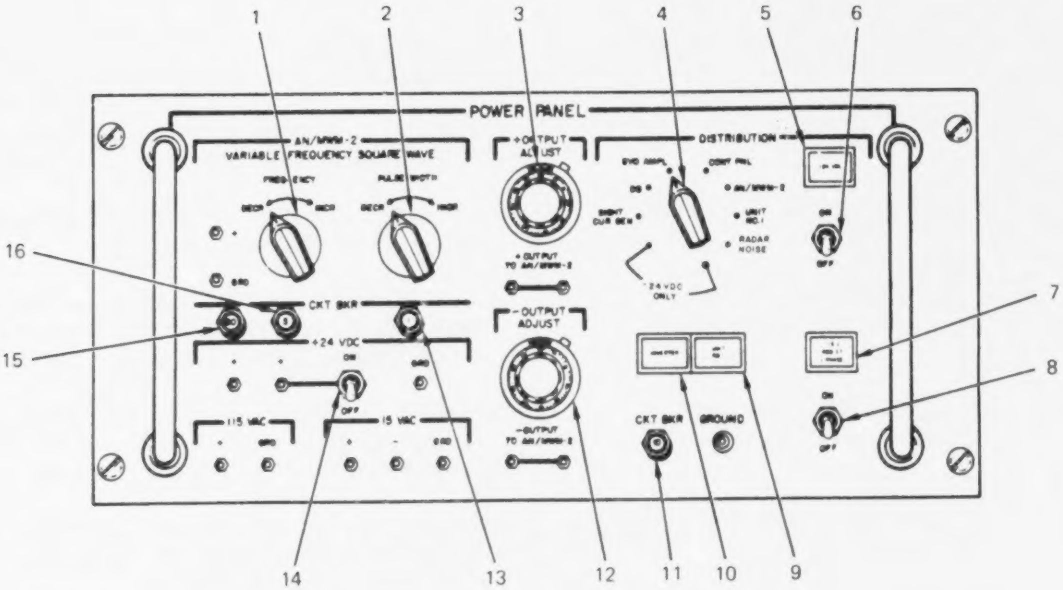
Figure 2-2 index no.	Control or indicator	Function
		AUTO - Provides simulated automatic clear mode signals to DB under test and AUTO clear mode logic signals to circuitry within test panel assembly. OFF - No function (open switch position). MAN - Provides simulated manual clear mode signals to DB under test and MAN clear mode logic signals to circuitry within test panel assembly.
15	RATE HI/LO rotary switch, S8	Provides simulated HI or LO gun motor rate signals (normally supplied by system control panel switch) to DB under test. Also, provides HI-LO rate logic signals to circuitry within test panel assembly.
16	RESET momentary action pushbutton switch, S19	When pressed, provides signal to reset test panel assembly logic circuitry latching gates.
17	BURST LIMIT ON/OFF toggle switch, S10	Provides simulated burst limit on/off signals (normally provided through system control panel) to DB under test. Also provides burst limit logic signals to circuitry within test panel assembly.
18	LAST ROUND ON/OFF toggle switch, S1	Non-functional, to be left in OFF position.
19	TRIGGER ON/OFF toggle switch, S9	Simulates trigger function (normally provided through system hand control) to DB under test. Also provides trigger logic signals to circuitry within test panel assembly.
20	K13 indicator lamp, DS20	When lit, indicates proper operation of relay K13 in DB under test.
21	K15 indicator lamp, DS22	When lit, indicates proper operation of relay K15 in DB under test.
22	K16 indicator lamp, DS21	When lit, indicates proper operation of relay K16 in DB under test.
23	RIGHT LIMIT ON/OFF toggle switch, S13	Provides simulated right azimuth limit signal (normally supplied by system azimuth limit switches) to DB under test.

Table 2-2. Distribution Box Panel 2A1A2, List of Controls and Indicators - Continued

Figure 2-2 index no.	Control or indicator	Function
24	LEFT LIMIT ON/OFF toggle switch, S14	Provides simulated left azimuth limit signal (normally supplied by system azimuth limit switches) to DB under test.
25	TEST SYSTEM POWER 5 thermal overload circuit breaker, CB1	Protects test panel assembly 24 Vdc circuitry.
26	TEST SYSTEM POWER +24 VDC indicator lamp, DS24	When lit, indicates 24 Vdc operating power being applied to test panel assembly.
27	TEST SYSTEM POWER +24 VDC ON/OFF toggle switch, S16	When set to ON, applies 24 Vdc operating power (from test set power panel assembly) to test panel assembly.
28	TEST SYSTEM POWER 0.5 AMP fuse, F1	Protects test panel assembly 5 Vdc circuitry.
29	TEST SYSTEM POWER +5 VDC indicator lamp, DS23	When lit, indicates 5 Vdc operating power being applied to test panel assembly.
30	TEST SYSTEM POWER +5 VDC ON/OFF toggle switch, S15	When set to ON, applies 5 Vdc operating power (from AN/TPM-22 radar test set) to test panel assembly.
31	EL LIMIT ON/OFF toggle switch, S12	Provides simulated elevation limit signal (normally applied by system elevation limit switch) to DB under test.
32	RELAY TIME SELECTORS CHANNEL B rotary switch, S18	Allows selection of relay switching signals from DB under test for monitoring at INPUT B coaxial connector. Also, allows selection of various test panel assembly input and output signals for monitoring at test panel assembly test points.
33	RADAR ELECTRONICS ON/OFF toggle switch, S7	Simulates radar-power switch function (normally provided by system control panel switch) to DB under test.
34	RELAY TIME SELECTORS CHANNEL A rotary switch, S17	Allows selection of relay switching signals from DB under test for monitoring at INPUT A coaxial connector. Also allows selection of various test panel assembly input and output signals for monitoring at test panel assembly test points.

Table 2-2. Distribution Box Panel 2A1A2, List of Controls and Indicators - Continued

Figure 2-2 index no.	Control or indicator	Function
35	ACQ TIME ON/OFF toggle switch, S11	Provides simulated acquisition time delay signal (normally provided by system SCG) to DB under test.
36	LOAD ON/OFF toggle switch, S2	Simulates load switch function (normally provided by system drum assembly) to DB under test.
37	K17 indicator lamp, DS19	When lit, indicates proper operation of relay K17 in DB under test.
38	K14 indicator lamp, DS18	When lit, indicates proper operation of relay K14 in DB under test.
39	K1 indicator lamp, DS17	When lit, indicates proper operation of relay K1 in DB under test.
40	AZIMUTH AMPL NO. 2 indicator lamp, DS16	When lit, indicates proper operation of azimuth servo amplifier No. 2 operating power circuitry in DB under test.
41	AZIMUTH AMPL NO. 1 indicator lamp, DS15	When lit, indicates proper operation of azimuth servo amplifier No. 1 operating power circuitry in DB under test.
42	ELEVATION AMPL indicator lamp, DS14	When lit, indicates proper operation of elevation servo amplifier operating power circuitry in DB under test.
43	GUN MOTOR indicator lamp, DS13	When lit, indicates proper operation of gun motor operating power circuitry in DB under test.
44	BRAKE indicator lamp, DS12	When lit, indicates proper operation of gun motor brake operating power circuitry in DB under test.
45	K12 indicator lamp DS11	When lit indicates proper operation of K12 relay.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15
16
POWER PANEL
AN/MWM-2
VARIABLE FREQUENCY SQUARE WAVE
FREQUENCY
DECR
INCR
PULSE WIDTH
DECR
INCR
+
GRD
CKT BKR
+24 VDC
+
+
ON
OFF
GRD
115 VAC
+
GRD
15 VAC
+
-
GRD
+OUTPUT ADJUST
+OUTPUT TO AN/MWM-2
-OUTPUT ADJUST
-OUTPUT TO AN/MWM-2
DISTRIBUTION
DS
COMP PNL
AN/MWM-2
UNIT NO.1
RADAR NOISE
24 VDC ONLY
ON
OFF
CKT BKR
GROUND
ON
OFF
AR 904520

Figure 2-3. Power panel 2A1A3, controls and indicators.

Table 2-3 Power Panel 2A1A3, List of Controls and Indicators

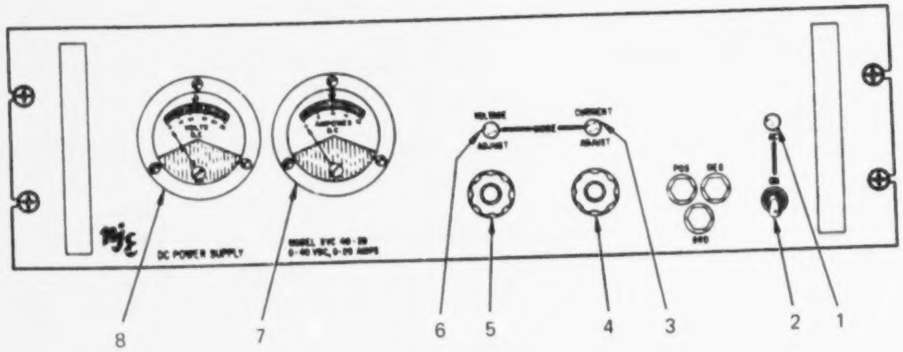
Figure 2-3 index no.	Control or indicator	Function
1	AN/MWM-2 VARIABLE FREQUENCY SQUARE WAVE FREQUENCY potentiometer, R1	Not used.
2	AN/MWM-2 VARIABLE FREQUENCY SQUAREWAVE PULSE WIDTH potentiometer, R2	Not used.
3	+OUTPUT ADJUST potentiometer, R7	Provides voltages required to test potentiometers in the SCG test panel.
4	DISTRIBUTION rotary switch, S1	Controls distribution of operating power to test set test panel assemblies, and to AN/TPM-22 Radar Test Set (UNIT 1). The switch positions and their functions are as follows: +24 VDC ONLY - No function (open switch position). SIGHT CUR GEN - Provides 24 Vdc operating power to SCG panel. Also distributes voltages from test set inverter and AN/TPM-22 Radar Set (UNIT 1) to SCG panel for use as test signal inputs to system SCG under test. DB - Provides 24 Vdc and 5 Vdc (from AN/TPM-22 Radar Test Set) operating power to distribution box panel. SVO AMPL - Provides 24 Vdc operating power to servo amplifier panel. CONT PNL - Provides 24 Vdc operating power to control panel. AN/MWM-2 - Provides 24 Vdc, for AN/MWM-3 Organizational Maintenance Test Set. UNIT NO. 1 - Provides 24 Vdc operating power to AN/TPM-22 Radar Test Set (UNIT 1). Also distributes voltages from

Table 2-3. Power Panel 2A1A3, List of Controls and Indicators - Continued

Figure 2-3 index no.	Control or indicator	Function
		test set inverter and ±15 Vdc power supply to AN/TPM-22 radar test set for use as test signals. RADAR NOISE - Provides 24 Vdc to AN/TPM-22 Radar Test Set (UNIT 1). Also applies dc power to amplifiers AR1 and AR2 in the SCG servo test panel. This condition is required when making noise test.
5	DISTRIBUTION +24 VDC indicator lamp, DS4	When lit, indicates 24 Vdc operating power being applied to panel assembly.
6	DISTRIBUTION +24 VDC ON/OFF toggle switch, S2	When set to ON, applies 24 Vdc (from test set batteries) to panel assembly.
7	115 V 400 CY1 PHASE indicator lamp, DS3	When lit, indicates 115 Vac operating power being distributed to test set battery charger and counter.
8	115 V 400 CY1 PHASE ON/OFF toggle switch, S4	When set to ON, distributes 115 Vac (from shelter power source) to test set battery charger and counter.
9	UNIT NO. 1 indicator lamp, DS2	When lit, indicates 24 Vdc operating power being applied to AN/TPM-22 Radar Test Set (UNIT 1).
10	INVERTER indicator lamp, DS1	When lit, indicates 24 Vdc operating power being applied to test set inverter.
11	CKT BKR - 10 thermal overload circuit breaker, CB1	Protects test set inverter.
12	-OUTPUT ADJUST potentiometer, R6	Provides voltages required to test potentiometers in the SCG panel.
13	CKT BKR - 1 thermal overload circuit breaker, CB4	Protects panel assembly 115 Vac distribution circuitry to 115 Vac test points.
14	+24 VDC ON/OFF toggle switch, S3	When set to ON, provides 24 Vdc at +24 VDC + test point shown connected to switch.

Table 2-3. Power Panel 2A1A3, List of Controls and Indicators - Continued

Figure 2-3 index no.	Control or indicator	Function
15	CKT BKR - 50 thermal overload circuit breaker, CB2	Protects panel assembly 24 Vdc circuitry.
16	CKT BKR - 5 thermal overload circuit breaker, CB3	Protects panel assembly 24 Vdc power distribution circuitry to the following: a. Test set SCG panel. b. Test set distribution box panel. c. Test set control panel. d. Panel assembly +24 VDC test points.

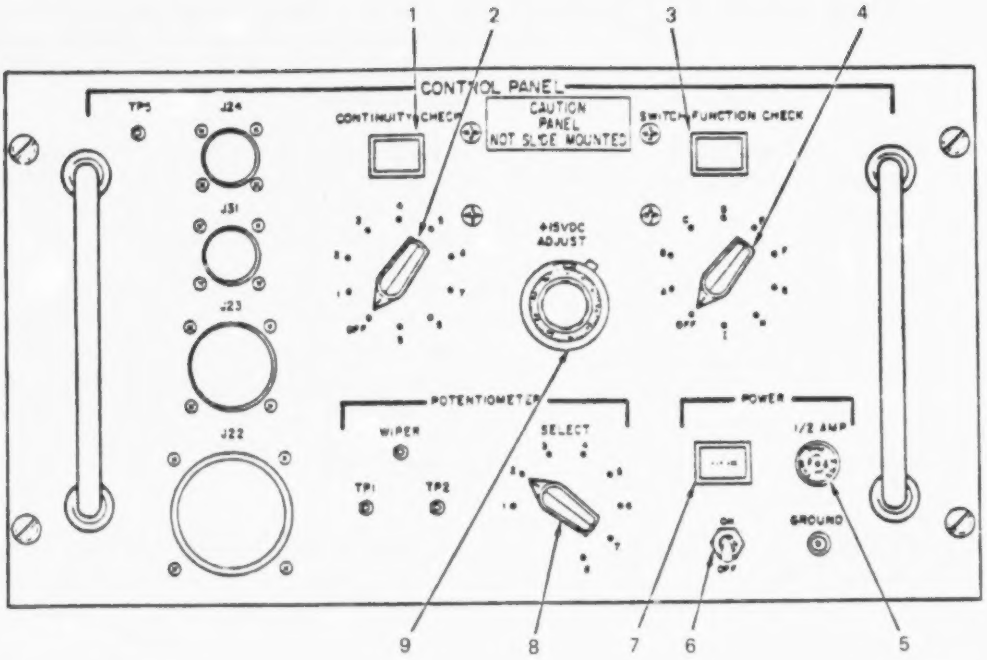

VOLTS D.C.
AMPERES D.C.
VOLTAGE
CURRENT
MODE
ADJUST
ADJUST
POS
NEG
GND
DC POWER SUPPLY
0-40 VDC, 0-20 AMPS
8
7
6
5
4
3
2
1

AR 904872

Figure 2-4. Battery charger 2A1A4, controls and indicators.

Table 2-4. Battery Charger 2A1A4, List of Controls and Indicators

Figure 2-4 index no.	Control or indicator	Function
1	AC indicator lamp	When lit, indicates 115 Vac operating power being applied to battery charger.
2	AC-ON toggle switch	When set to ON, applies 115 Vac operating power (from test set power panel assembly) to battery charger.
3	MODE CURRENT ADJUST indicator lamp	When lit, indicates operation of battery charger in current-regulating mode. This lamp is provided as a convenience indicator only.
4	MODE CURRENT ADJUST (coarse and fine) potentiometer	Controls battery charger current output.
5	MODE VOLTAGE ADJUST (coarse and fine) potentiometer	Controls battery charger voltage output.
6	MODE VOLTAGE ADJUST indicator lamp	When lit, indicates operation of battery charger in voltage regulating mode. This lamp is provided as a convenience indicator only.
7	AMPERES DC meter	Indicates current output from battery charger.
8	VOLTS DC meter	Indicates voltage output from battery charger.


1
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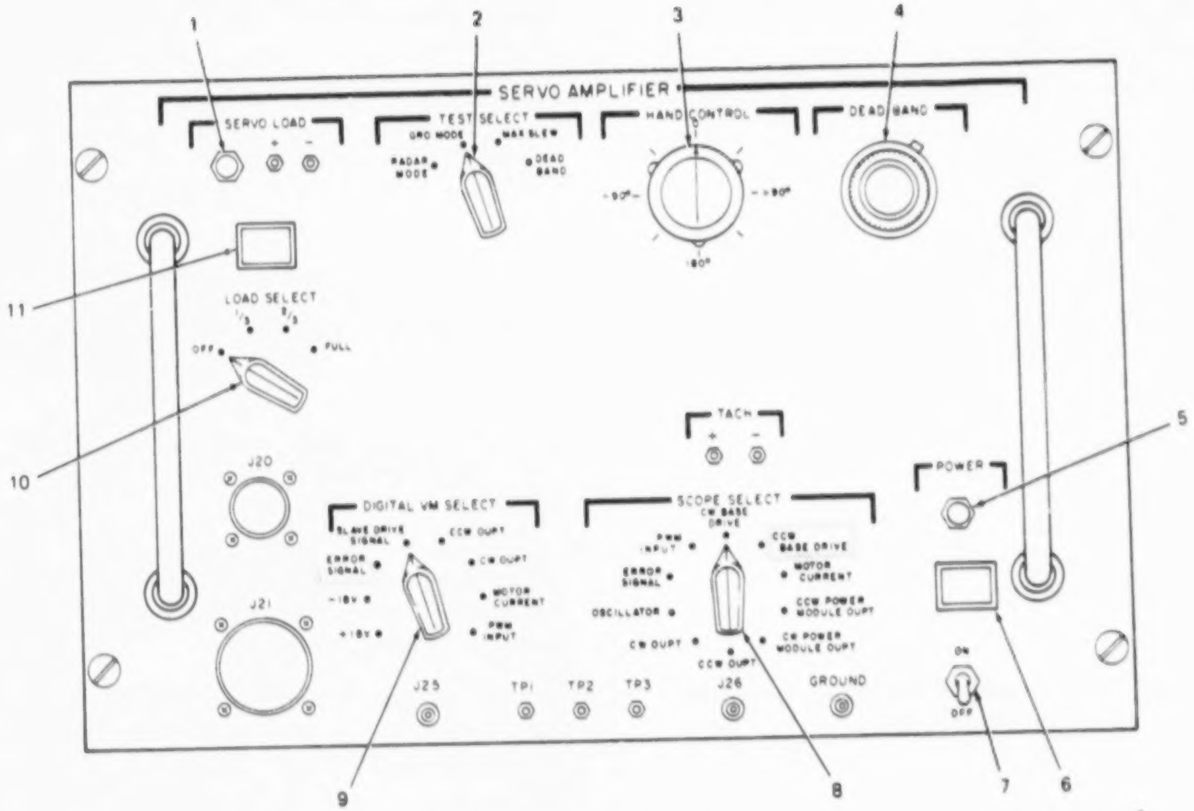
CONTROL PANEL
TP5
J24
CONTINUITY CHECK
CAUTION
PANEL
NOT SLIDE MOUNTED
SWITCH FUNCTION CHECK
J31
+15VDC
ADJUST
OFF
OFF
J23
POTENTIOMETER
POWER
J22
WIPER
SELECT
1/2 AMP
TP1
TP2
ON
OFF
GROUND
9
8
7
6
5

Figure 2-5. Control panel 2A2A1, controls and indicators.

Table 2-5. Control Panel 2A2A1, List of Controls and Indicators

Figure 2-5 index no.	Control or indicator	Function
1	CONTINUITY CHECK indicator, DS2	When lit, indicates continuity through circuitry selected by CONTINUITY CHECK rotary switch, in control panel under test.
2	CONTINUITY CHECK rotary switch, S2	Selects circuitry checked for continuity in control panel under test. Also, allows selection of various test panel assembly input and output signals for monitoring at test point TP5.
3	SWITCH FUNCTION CHECK indicator lamp, DS1	When lit, indicates continuity through switch circuitry, selected by SWITCH FUNCTION CHECK rotary switch in control panel under test.
4	SWITCH FUNCTION CHECK rotary switch, S1	Selects switch circuitry checked for continuity in control panel under test. Also, allows selection of various test panel assembly input and output signals for monitoring at test point TP5.
5	POWER 1/2 AMP fuse, F1	Protects test panel assembly 24 Vdc circuitry.
6	+24 VDC ON/OFF toggle switch, S3	When set to ON, applies 24 Vdc operating power (from test set power panel) to test panel assembly.
7	POWER +24 VDC indicator lamp, DS3	When lit, indicates 24 Vdc operating power being applied to test panel assembly.
8	POTENTIOMETER SELECT rotary switch, S4	Selects potentiometers, and other resistive elements, in control panel under test for resistance checks at POTENTIOMETER WIPER, TP1, and TP2 test points. Also provides test signal to check out rounds-remaining counter in control panel under test.
9	+15 VDC ADJUST potentiometer, R10	Provides centering adjustments for 15 volt power to control panel under test.


1
2
3
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SERVO AMPLIFIER
SERVO LOAD
+
-
TEST SELECT
GRD MODE
MAX SLEW
RADAR MODE
DEAD BAND
HAND CONTROL
0
-90°
+90°
180°
DEAD BAND
11
LOAD SELECT
1/3
2/3
OFF
FULL
10
TACH
+
-
5
POWER
J20
DIGITAL VM SELECT
SLAVE DRIVE SIGNAL
CCW OUPT
ERROR SIGNAL
CW OUPT
-18V
MOTOR CURRENT
+18V
PWM INPUT
SCOPE SELECT
CW BASE DRIVE
PWM INPUT
CCW BASE DRIVE
ERROR SIGNAL
MOTOR CURRENT
OSCILLATOR
CCW POWER MODULE OUPT
CW OUPT
CW POWER MODULE OUPT
CCW OUPT
J21
J25
TP1
TP2
TP3
J26
GROUND
ON
OFF
9
8
7
6

ARR82-28629

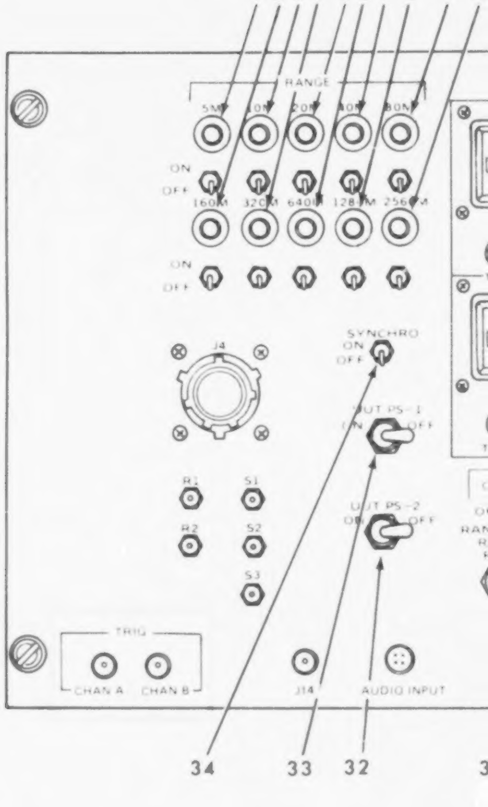
Figure 2-6. Servo amplifier panel 2A2A2, controls and indicators.

Table 2-6. Servo Amplifier Panel 2A2A2, List of Controls and Indicators

Figure 2-6 index no.	Control or indicator	Function
1	SERVO LOAD 35 thermal overload circuit breaker, CB1	Protects servo amplifier under test 24 Vdc circuitry.
2	TEST SELECT rotary switch, S1	Selects test mode in which servo amplifier under test is checked for response to simulated hand control signals. The switch positions and their functions are as follows: RADAR MODE - Provides simulated system radar mode of operation hand control input signals (normally set at system control panel) to servo amplifier under test. GRD MODE - Provides simulated system ground mode of operation hand control input signals (normally set at system control panel) to servo amplifier under test. MAX SLEW - Provides simulated maximum slew hand control input signal to servo amplifier under test. DEAD BAND - Allows simulated hand control dead band input signals (from DEAD BAND potentiometer) to be applied to servo amplifier under test.
3	HAND CONTROL potentiometer, R1	Provides simulated hand control input signals (normally supplied by system hand control) to servo amplifier under test.
4	DEAD BAND potentiometer, R2	Provides simulated hand control dead band input signals (normally supplied by system hand control) to servo amplifier under test.
5	POWER 7-1/2 thermal overload circuit breaker, CB2	Protects test panel assembly and servo amplifier load assembly 24 Vdc circuitry.
6	+24 VDC indicator lamp, DS2	When lit, indicates 24 Vdc operating power being applied to test panel assembly and servo amplifier load assembly.

Table 2-6. Servo Amplifier Panel 2A2A2, List of Controls and Indicators - Continued

Figure 2-6 index no.	Control or indicator	Function
7	+24 VDC ON/OFF toggle switch, S9	When set to ON, applies 24 Vdc operating power from test set power panel assembly to test panel assembly and servo amplifier load assembly.
8	SCOPE SELECT rotary switch, S6	Selects output or test point on A3 component board of servo amplifier under test, to be monitored by an oscilloscope at J26 coaxial connector.
9	DIGITAL VM SELECT rotary switch, S5	Selects output or test point on A3 component board of servo amplifier under test, to be monitored by a digital voltmeter at J25 coaxial connector.
10	LOAD SELECT rotary switch, S2	Selects degree of simulated loading applied by test set servo amplifier load assembly to servo amplifier under test.
11	LOAD ON indicator lamp, DS1	When lit, indicates test set servo amplifier load assembly connected to output of servo amplifier under test.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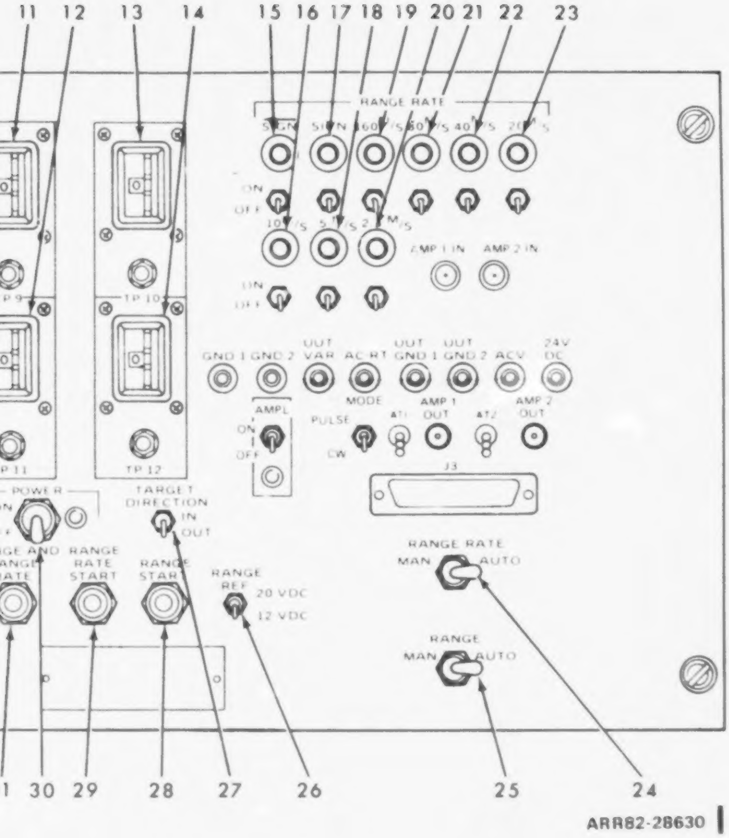
RANGE
5M
10M
20M
40M
80M
ON
OFF
160M
320M
640M
1280M
2560M
ON
OFF
J4
SYNCHRO
ON
OFF
OUT PS-1
ON
OFF
R1
R2
S1
S2
S3
OUT PS-2
ON
OFF
RAN
TRIG
CHAN A
CHAN B
J14
AUDIO INPUT
34
33
32

Figure 2-7. SCG servo test


11
12
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22
23
RANGE RATE
SIGN
SIGN
160 M/S
80 M/S
40 M/S
20 M/S
ON
OFF
10 M/S
5 M/S
2 M/S
AMP 1 IN
AMP 2 IN
ON
OFF
TP 10
GND 1
GND 2
OUT VAR
AC RT
OUT GND 1
OUT GND 2
ACV
24V DC
AMPL
ON
OFF
MODE
PULSE
CW
AT1
AMP 1 OUT
AT2
AMP 2 OUT
J3
TP 12
POWER
TARGET DIRECTION
IN
OUT
RANGE RATE START
RANGE START
RANGE REF
20 VDC
12 VDC
RANGE RATE
MAN
AUTO
RANGE
MAN
AUTO
30
29
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27
26
25
24
ARR82-28630

panel 2A2A6, controls and indicators.

Table 2-7. SCG S
List of Contr

Figure 2-7 index no.	Control or indicator
1	RANGE 5M indicator (DS1 and switch, (S14)
2	RANGE 160M indicator (D and switch (S15)
3	RANGE 10M indicator (DS and switch (S16)
4	RANGE 320M indicator (D and switch (S20)
5	RANGE 20M indicator (DS and switch (S16)
6	RANGE 640M indicator (D and switch (S21)
7	RANGE 40M indicator (DS and switch (S17)
8	RANGE 1280M indicator (DS18) and switch (S22
9	RANGE 80M indicator (DS and switch (S18)
10	RANGE 2560M indicator (DS19) and switch (S23
11	Thumbwheel switch (SSA)
12	Thumbwheel switch (SSC)
13	Thumbwheel switch (SSB)
14	Thumbwheel switch (SSD)

ervo Test Panel 2A2A6,
ols and Indicators

	Function
0)	When set to ON, provides 5 meter data (normally supplied by radar set) to the SCG and lights indicator.
S11)	Same as above for 160 meters.
12)	Same as above for 10 meters.
S16)	Same as above for 320 meters.
12)	Same as above for 20 meters.
S17)	Same as above for 640 meters.
13)	Same as above for 40 meters.
)	Same as above for 1280 meters.
14)	Same as above for 80 meters.
)	Same as above for 2560 meters.
	When set to desired number, switch connects voltage or signal data to test point 9 for operation measurements.
	Same as index no. 11 above for test point 11.
	Same as index no. 11 above for test point 10.
	Same as index no. 11 above for test point 12.

Table 2-7. SCG Servo Test Panel 2A2A6, List of Controls and Indicators - Continued

Figure 2-7 index no.	Control or indicator	Function
15	RANGE/RATE $\overline{\text{SIGN}}$ indicator (DS1) and switch (S5)	When set to ON, provides $\overline{\text{SIGN}}$ data (normally supplied by the radar set) to SCG and lights indicator.
16	RANGE/RATE 10M/S indicator (DS7) and switch (S11)	Same as index no. 15 above for 10M/S.
17	RANGE/RATE SIGN indicator (DS2) and switch (S6)	Same as index no. 15 above for SIGN.
18	RANGE/RATE 5M/S indicator (DS8) and switch (S12)	Same as index no. 15 above for 5M/S.
19	RANGE/RATE 160M/S indicator (DS3) and switch (S7).	Same as index no. 15 above for 160M/S.
20	RANGE/RATE 2.5M/S indicator (DS9) and switch (S13)	Same as index no. 15 above for 2.5M/S.
21	RANGE/RATE 80 M/S indicator (DS4) and switch (S8)	Same as index no. 15 above for 80M/S.
22	RANGE/RATE 40M/S indicator (DS5) and switch (S9)	Same as index no. 15 above for 40M/S.
23	RANGE/RATE 20M/S indicator (DS6) and switch (S10)	Same as index no. 15 above for 20M/S.
24	RANGE RATE MAN/AUTO switch	When set to MAN range rate data is manually fed to the sight current generator under test. When set to AUTO range rate data is automatically fed to SCG under test.
25	RANGE MAN/AUTO switch	Same as index no. 24 above for range data.

Table 2-7. SCG Servo Test Panel 2A2A6, List of Controls and Indicators - Continued

Figure 2-7 index no.	Control or indicator	Function
26	RANGE REF 12/20 VDC switch	Provides either a 12 or 20 Vdc reference voltage to SCG under test.
27	TARGET DIRECTION IN/OUT switch	Controls direction of simulated target being supplied to SCG under test.
28	RANGE START switch	When pressed, starts target ranging and this data is fed to SCG under test.
29	RANGE RATE START switch	Same as index no. 28 above for range rate data.
30	POWER ON/OFF switch	Provides 24 Vdc voltage for operation of SCG servo test panel.
31	RANGE AND RANGE RATE switch	Same as index no. 28 above for range and range rate data.
32	UUT PS-2 ON/OFF switch	Provides +15 Vdc when testing potentiometers of SCG under test.
33	UUT-PS-1 ON/OFF switch	Provides -15 Vdc, 115 Vac and 26 Vac to power series assembly of SCG under test.
34	SYNCHRO ON/OFF switch	Provides synchro voltages to SCG under test.

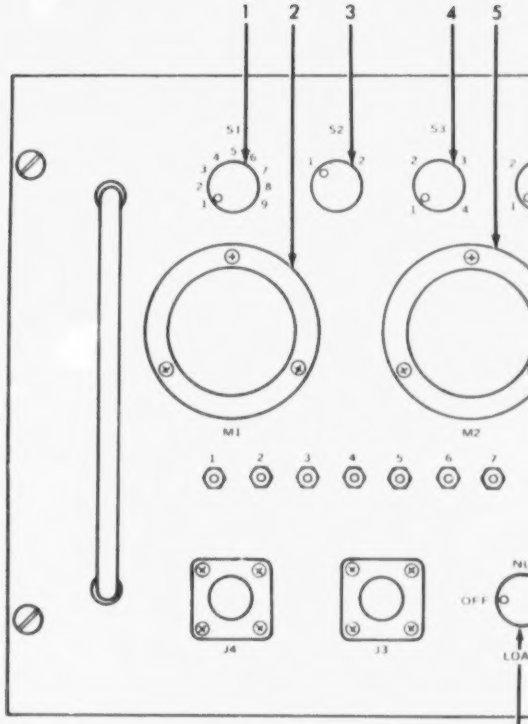
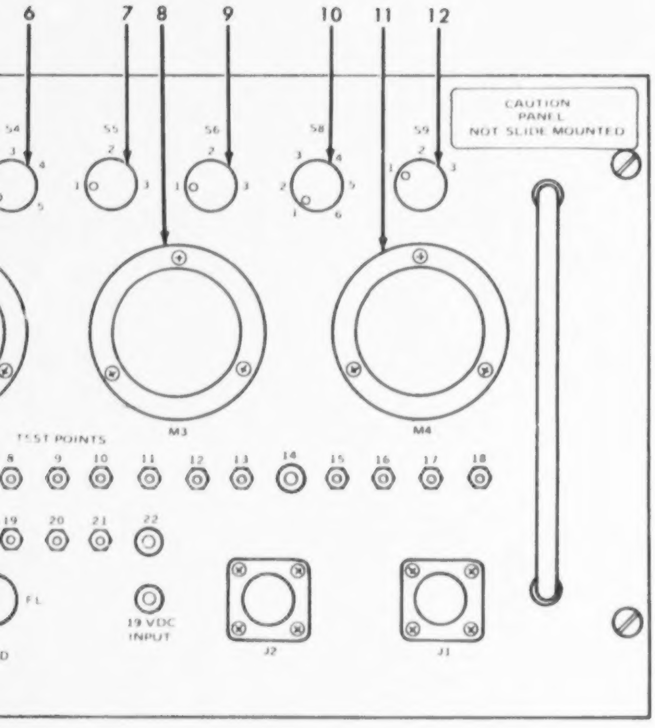

1
2
3
4
5
S1
S2
S3
M1
M2
J4
J3
OFF
13

Figure 2-8. Inverter/converter tes


6
7
8
9
10
11
12
CAUTION
PANEL
NOT SLIDE MOUNTED
S4
S5
S6
S8
S9
M3
M4
TEST POINTS
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
FL
19 VDC
INPUT
J2
J1
D

AR918150

t panel 2A2A4, controls and indicators.

Table 2-8. Inverter/
List of Con

Figure 2-8 index no.	Control or indicator
1	S1 switch
2	M1 dc ammeter
3	S2 switch
4	S3 switch
5	M2 dc ammeter
6	S4 switch
7	S5 switch
8	M3 dc ammeter
9	S6 switch
10	S8 switch
11	M4 ac voltmeter
12	S9 switch
13	LOAD switch

Converter Test Panel 2A2A4,
rols and Indicators

Function
When set to its various positions, input and output voltages of the inverter are monitored under simulated load conditions.
Monitors input dc current of the inverter under test.
Provides motor load or resistive load to inverter under test.
Provides simulated load when testing inverter under test.
Monitors ±15 Vdc power supply and inverter output current when under test.
Enables monitoring of input dc current and ac voltage output when testing power inverter of the radar set.
Selects no load, resistive load, or fan load when testing power inverter of the radar set.
Monitors input dc current of the power inverter (located in the radar set) when inverter is being tested.
Enables monitoring of ac output voltages of power inverter under test or inverter under test.
Selects various load conditions when testing ±15 Vdc power supply of the SCG and AN/TSM-100.
Monitors ac output voltages of power inverter under test and inverter under test.
Selects dc current output of either ±15 Vdc power supply or inverter.
Selects normal or full load for motor load assembly when testing inverter.

Table 2-9. AN/TSM-100 Operational Checklist

Procedure	Normal indication	If indication abnormal
Initial AN/TSM-100 Turn-on Procedures:		
1. Make sure all power switches on test set are placed to OFF position and all circuit breakers are in.		
2. Visually inspect test set components for damage or wear.		Replace or repair as required.
3. Make sure that test set battery charger (2A1A4), counter (2A2A3), motor load assembly (2A2A4A1) are within their calibration periods.		Refer to TB 43-180, TB 9-6130-300-14 and TB 9-4933-210-34 and perform appropriate calibration.
WARNING Failure to perform the following step can result in a potentially dangerous buildup of battery vapor inside the shelter.		
4. Remove battery vent cover, on outside of shelter.		
NOTE The electrolyte level in the batteries should be checked weekly. In dry climates the check should be made twice a week. Refer to Chapter 6, Section VII for proper procedures to check electrolyte level.		
5. Remove access covers from battery and inverter (2A1A5), and disconnect both test set batteries (2A1A5A1 and 2A2A5A1).		

Table 2-9. AN/TSM-100 Operational Checklist - Continued

Procedure	Normal indication	If indication abnormal
6. At power panel (2A1A3):		
a. Set DISTRIBUTION switch to +24 VDC ONLY.	No indication	
b. Set 115 V 400 CY 1 PHASE ON/OFF switch to ON.	115 V 400 CY 1 PHASE indicator lights.	Perform power panel assembly checkout, table 6-2.
7. At battery charger (2A1A4):		
a. Set AC-ON switch to ON.	AC indicator lights NOTE Disregard all other indications.	Refer to battery charger manual and check out battery charger.
b. Monitor VOLTAGE DC meter and use VOLTAGE ADJUST control as necessary to set battery charger voltage output.	+27.0 to +27.5 Vdc (refer to table 6-27 for proper voltage setting when operating at extreme temperature.	Refer to battery charger manual and check out battery charger.
CAUTION Make sure when the following step is performed, the AC indicator is extinguished and VOLTS DC meter indicates 0 prior to connecting the batteries.		
8. Set battery charger (2A1A4) AC-ON switch to the OFF position. Connect test batteries (2A1A5A1 and 2A2A5A1) and replace their access covers.	AC indicator goes out.	Refer to battery charger manual.

Table 2-9. AN/TSM-100 Operational Checklist - Continued

Procedure	Normal indication	If indication abnormal
9. Set battery charger (2A1A4) AC-ON switch to ON. At battery charger (2A1A4), set CURRENT ADJUST control fully clockwise (cw) (for maximum output).	AC indicator AMPERES meter indicates charging current.	Refer to battery charger manual. Perform power panel assembly checkout, table 6-2.
10. At power panel (2A1A3): Set +24 VDC DISTRIBUTION ON/OFF switch to ON.	+24 VDC indicator lights.	Perform power panel assembly checkout, table 6-2.
11. At power panel (2A1A3): Set DISTRIBUTION switch to SIGHT CUR GEN.	INVERTER indicator lights. Unit 1 blower operates.	Perform power panel assembly checkout, table 6-2.
12. At AN/TPM-22 Radar Test Set (UNIT 1) power supply panel (1A1A3), set TEST MODE switch to FC CONSOLE. Set +24 VDC to ON.	UNIT No. 1 indicator lights and blower runs.	
13. At SCG panel (2A1A1): Set SYSTEM POWER ON/OFF switch to ON.	SYSTEM POWER indicator lights.	Perform SCG test panel assembly checkout, table 6-4.
14. At AN/TPM-22 Radar Test Set (UNIT 1) power panel (1A1A3) make sure TEST MODE switch is in FC CONSOLE.		
15. At power panel assembly (2A1A3): Set DISTRIBUTION switch to DB.	INVERTER indicator goes out.	Perform power panel assembly checkout, table 6-2.
16. At distribution box panel (2A1A2): a. Set TEST SYSTEM POWER +5 VDC ON/OFF switch to ON.	+5 VDC indicator lights.	Perform distribution box panel checkout, table 6-6.

Table 2-9. AN/TSM-100 Operational Checklist - Continued

Procedure	Normal indication	If indication abnormal
b. Set TEST SYSTEM POWER +24 VDC ON/OFF switch to ON.	+24 VDC indicator lights.	Perform distribution box panel checkout, table 6-6.
Control panel (2A2A1) Turn-on procedures:		
17. At power panel (2A1A3): Set DISTRIBUTION switch to CONT PNL.	UNIT No. 1 indicator goes out and blower stops.	
18. At control panel (2A2A1): Set POWER ON/OFF switch to ON.	+24 VDC indicator lights.	Perform control panel checkout, table 6-8.
Servo amplifier panel (2A2A2): turn-on procedures:		
19. At power panel (2A1A3): Set DISTRIBUTION switch to SVO AMPL.	No indication.	
20. At servo amplifier panel (2A2A2): Set POWER ON/OFF switch to ON.	+24 VDC indicator lights.	Perform servo amplifier panel checkout, table 6-10.
SCG Servo Test Panel (2A2A6) turn-on procedures:		
21. At power panel (2A1A3): Set DISTRIBUTION switch to SIGHT CUR GEN.	UNIT No. 1 and INVERTER indicators light and blower runs.	Perform power panel checkout, table 6-2.
22. At SCG servo test panel (2A2A6): Set POWER ON/OFF switch to ON.	POWER indicator lights.	Perform SCG servo test panel checkout, table 6-11.

Table 2-9. AN/TSM-100 Operational Checklist - Continued

Procedure	Normal indication	If indication abnormal
Counter (2A2A3) turn-on procedure:		
23. At counter (2A2A3): Set POWER ON/STANDBY switch to ON.	Display lights. Ignore other indicators.	Perform power panel assembly checkout, table 6-2. Refer to counter manual.
Power panel (2A1A3) AN/MWM-2 function turn-on procedure:		
24. At power panel (2A1A3): Set DISTRIBUTION switch to AN/MWM-2.	INVERTER indicator lights and blower stops.	Perform power panel checkout, table 6-2.
25. Turn all switches to OFF position.	All lights and indicators go out.	

Section II. OPERATION UNDER UNUSUAL CONDITIONS

In dry climates electrolyte level in the batteries should be checked weekly. Batteries should be fully charged and rested on an open circuit for approximately 2 hours before the check is made. The two-hour rest allows the potentially hazardous battery gases generated during charging to be completely vented out of the batteries. Refer to table 6-33 for proper voltage indication if charging under extreme temperature conditions.

CHAPTER 3

FUNCTIONING OF EQUIPMENT

Section I. AN/TSM-100 ELECTRONICS SYSTEM TEST SET ANALYSIS

3-1. General. The AN/TSM-100 Electronics System Test Set consists of the AN/TSM-100 test set, its accessory equipment, and test cables. The AN/TSM-100 is used to check out and fault isolate certain electronic assemblies of the M163A1 and M167A1 Vulcan Air Defense systems. The test panel assemblies furnish simulated system signals, loads, and operating power to the system being tested. This provides the means to test and troubleshoot an assembly to the subassembly and component level.

3-2. Accessory Equipment and Test Cables. The accessory equipment consists of adapters, cables, and extender boards. They are used as needed in the test and troubleshoot procedures. The test cables are used to connect the system assembly being checked out with the appropriate test panel assembly in the AN/TSM-100.

Section II. AN/TSM-100 FUNCTIONING OF EQUIPMENT

3-3. General.

a. The functional analysis of the AN/TSM-100 will consist of power distribution to the test panels, analysis of each test panel, and detailed analysis of the component assemblies of each test panel. Because each test panel operating power is controlled by the power panel assembly, its functional analysis will be discussed first. Figure FO-1 shows the power panel assembly in detail, and its associated cabling to the other AN/TSM-100 test panels. Figures FO-2 through FO-4 aid in showing the interconnecting of UNIT 1 AN/TPM-22 test set to UNIT 2 AN/TSM-100.

b. The detailed analysis of the AN/TSM-100 is separated into a functional analysis of each major assembly. Since the servo amplifier panel and the motor load assembly function together, the functional analysis of these two panels is combined. Power distribution is described in the analysis of the AN/TSM-100 power panel assembly.

c. The AN/TSM-100 inverter (2A1A5A2) and the ±15 Vdc power supply (2A2A5A2) are not repairable at the DS maintenance level. They are analyzed only on a signal input-output basis. The AN/TSM-100 battery charger (2A1A4) and counter (2A2A3) are discussed in manufacturer's manuals; thus, analysis of these two assemblies is also on a signal input-output basis.

3-4. AN/TSM-100 Power Distribution Analysis.

a. Operating power to the AN/TSM-100 test set is provided by the two batteries 2A1A5A1 and 2A2A5A1 and by the shelter's 115 Vac, 400 Hz, 1 phase supply. The battery charger 2A1A4, counter 2A2A3, and SCG servo test panel 2A2A6 require 115 Vac operating power. The 115 Vac used in the other test panels comes from the inverter assembly 2A1A5A2. In the following discussions, it is assumed that the +24 VDC switch S2 and 115 V 400 CY 1 PHASE switch are set to ON; also, that the battery charger AC-ON switch is set to ON and the voltage control is adjusted to 27.5 Vdc.

b. The AN/TSM-100 test set operation (that is, which test panel used or test performed) is controlled by the DISTRIBUTION switch S1 (fig. FO-5). Switch S1 is a 10-position rotary switch of which six positions are used for relay interlock control and four positions are open. DISTRIBUTION switch S1 positions are: SIGHT CUR GEN; DB SVO AMPL; CONT PNL; AN/MWM-2; UNIT

NO. 1; RADAR NOISE; and +24 VDC ONLY. Battery voltage is accessible at test points TP3 and TP4 with +24 VDC switch S2 set to ON. The output at TP4 is controlled by switch S3, +24 VDC, ON/OFF toggle switch. With 115 V 400 CY 1 PHASE switch S4 ON, the 115 VAC + test point and GRD test point (TP6 and TP7 respectively) are also active.

c. With DISTRIBUTION switch S1 set to SIGHT CUR GEN, +24 Vdc is applied to relays K7 coil and K3 coil via blocking diode CR12. Relays K7 and K3 are energized. When relay K7 is energized, +24 Vdc operating power is applied to SCG panel via J105-f. Circuit breaker CB3 provides overload protection for SCG panel. When relay K3 is energized, +24 Vdc operating power is applied to inverter 2A1A5A2 via J107-H. The outputs of the inverter are: +18 Vdc; 115 Vac; 400 Hz; and 280 V squarewave A and B phases. Resistors R3, R4, and R5 provide proper loading of the inverter. The +18 Vdc is applied to the SCG panel via relay K4-A2 and A3. J105-a. The 115 Vac is applied to SCG panel via relay K5-3 and K5-1 J105-b. The 280 V squarewave is applied to SCG panel via relay K4-E2 and K4-E3 (phase A) and K4-D2 and K4-D3 (phase B) J105-T and S respectively. When relays K4 and K5 are energized, the outputs of the inverter are inhibited to the SCG and are applied to UNIT 1. The inverter indicator DS1 is lit when 24 Vdc operating voltage is applied to the inverter. Relay K2 is also energized, routing 24 Vdc to UNIT 1. UNIT 1 indicator DS2 lights when K2 is energized. The 24 Vdc applied to UNIT 1 provides operating power to the AN/TPM-22 test set power supply. The output of power supply 1A1A4, is +5 Vdc, ±10 Vdc, ±20 Vdc, and -23 Vdc. The +5 Vdc is used for the distribution box panel. The other outputs are applied direct to the SCG panel via cable W121. With the voltage applied as described, the SCG panel is operational.

d. With DISTRIBUTION switch S1 set to DB, relays K8 and K2 are energized. With relay K8 energized, +24 Vdc is applied to distribution box panel 2A1A2 via relay contacts K8-3 and K8-5 and J105-V. With relay K2 energized, UNIT 1 indicator lights indicating +24 Vdc is applied to AN/TPM-22 Radar Test Set and the power supply is activated. This power supply provides +5 Vdc to the distribution box panel via J105-N. With both relays energized and both +24 Vdc and +5 Vdc operating power applied, the distribution box panel is operational.

e. When DISTRIBUTION switch S1 is set to SVO AMPL, relay K9 is energized. Both sets of contacts for relay K9 close, providing +24 Vdc operating power to the servo amplifier panel (2A2A2) via J105-f. During system servo amplifier checkout, two sets of relay contacts are used because of current requirements. Circuit breaker CB2 (50 A) is used as overload protection for the test panel assembly.

f. When DISTRIBUTION switch S1 is set to CONT PNL, relay K10 is energized. Relay K10 contacts close providing +24 Vdc operating power to the control panel (2A2A1) via J105-m. Circuit breaker CB3 provides overload protection for the test panel assembly.

g. When DISTRIBUTION switch S1 is set to AN/MWM-2, relays K3 and K6 are energized. With relay K3 energized, the inverter is activated providing +18 Vdc operating voltage to the ±15 Vdc power supply via relay K6-3 and -5 contacts. The outputs of the ±15 Vdc power supply are applied with the - output to AN/MWM-2 potentiometer R6 and the + output to AN/MWM-2 potentiometer R7. This is used to check out potentiometers in the SCG panel. The +24 Vdc used to energize relay K6 is also applied to the squarewave generator. The squarewave generator is not used to check out the AN/MWM-3 test set.

h. When DISTRIBUTION switch S1 is set to UNIT 1 (refer to fig. FO-4), relay K2 is energized. This applies +24 Vdc to AN/TPM-22 test set as previously stated. If the AN/TPM-22 test set power supply assembly TEST MODE switch is set to PWR SUP/SERVO, relays K5 and K3 are energized. When relay K3 energizes, the inverter is operational and the 115 Vac 1 phase is applied to UNIT 1 via relay K5 contacts. At this time 115 Vac is inhibited to the SCG servo test panel. When the 280V A/280V B/+15V/-15V switch S32 on power supply and servo test panel is closed, +24 Vdc is applied to the coil of relay K4, energizing K4. With K4 energized, the other outputs of the inverter are supplied to UNIT 1 and the ±15 Vdc supply is activated. Its output is also applied to UNIT 1.

i. With DISTRIBUTION switch S1 in the +24 VDC ONLY position, +24 Vdc is provided to test points TP3 and to TP4 (via switch S3). Use of the +24 Vdc for external purposes is convenient at these test points. In the +24 VDC ONLY position, the batteries may be charged without a load.

3-5. Sight Current Generator Panel 2A1A1.

a. General. The SCG panel is used to check out and fault isolate a system SCG. The SCG under test is mated to the SCG panel with test cables. Switches, potentiometers, test circuitry, a magnet assembly, and a torque motor assembly in the SCG panel are used to simulate system inputs and loads. Indicators and test points on the SCG panel are provided to monitor the operation of the SCG being tested.

(1) Distribution of the AN/TSM-100 inverter output power to the SCG under test is controlled through relay K1. Relay K1 is energized when the test panel assembly system power S12 is switched on. (Refer to fig. FO-6).

(2) Distribution of the AN/TPM-22 Radar Test Set (UNIT 1) voltages to the SCG under test is controlled through relay K2. Relay K2 is energized through the test panel assembly MODE SEL switch S11. Relay K2 is energized only when the SCG under test is being checked in certain operating modes. The voltages simulate system radar power supply reference voltages.

(3) Simulated radar range and range rate signals, and manual range and range rate signals, are applied to the SCG under test by means of potentiometers. The radar range and range rate potentiometers operate on the ±10 Vdc reference voltages from the AN/TPM-22 Radar Test Set. The manual range and range rate potentiometers operate on a reference voltage supplied by the SCG under test. Automatic range and range rate signals are applied to the SCG under test from the SCG servo test panel through the SCG panel.

(4) Simulated system radar lead angle potentiometer inputs are provided by the test panel assembly traverse and elevation lead angle potentiometers. A simulated system cosine input is provided by the test panel cosine potentiometer. The potentiometers are the same as those used in the systems.

(5) Simulated system sight loads are provided by the test panel assembly magnet and torque motor load circuits. Sight cage test circuitry provides a means to check the sight cage circuits in the SCG under test.

(6) Ready-to-fire test circuitry provides a means to check the ready-to-fire circuit in the SCG under test.

Indicators are provided to show when the SCG ready-to-fire circuit is operating properly.

(7) A foot switch test circuit is provided to check operation of the foot switch circuitry in the SCG under test. A radiate command indicator shows if the circuits are operating properly.

(8) Test points 22 to 74 on the test panel assembly connect directly to the test connector on the SCG being checked. The SCG test connector provides access to points in the SCG circuitry to aid checkout and fault isolation procedures. Refer to table 3-1 for a list of all SCG test panel test points and the signals they monitor.

b. MODE Switch S11. With SYSTEM POWER switch set to ON, +24 Vdc is routed to the +24 Vdc bus in the SCG servo test panel and to the energizing coils of relay K1. With relay K1 energized, the outputs of the AN/TSM-100 inverter 2A1A5A2 are applied to the SCG under test. The +24 Vdc is also applied to SYSTEM POWER indicator DS12, lighting DS12. MODE switch S11 provides selection of the mode of operation for the SCG under test.

(1) RADAR READY. When MODE switch (S11) is set to RADAR READY, +24 Vdc operating power is distributed to the SCG under test. It is also applied to ACTION switch S9 and to relay K2, energizing K2. When relay K2 is energized, the simulated radar signals from unit 1 are applied to the SCG under test.

(2) K26 MANUAL. When MODE switch (S11) is set to K26 MANUAL, simulated system manual mode of operation, +24 Vdc is applied to the SCG under test. The +24 Vdc is also applied to DS7, K26 MANUAL indicators lighting DS7. When DS7 is lit, this indicates +24 Vdc is applied to K26 in the SCG under test. The +24 Vdc, through switches S11-B and S11-C, is distributed in the same manner as when MODE switch (S11) is set in the RADAR READY position.

(3) K25 EXTERNAL. When MODE switch is set to K25 EXTERNAL, simulating systems external mode of operation, +24 Vdc is applied to the SCG under test. Relay K2 is deenergized, inhibiting simulated radar signals from unit 1 to the SCG under test.

(4) TEST. When MODE switch (S11) is set to TEST, simulating system test mode of operation, +24 Vdc is applied to the SCG under test. The +24 Vdc, through switches S11-B, S11-C, and S11-D is distributed in the same manner as when MODE switch (S11) is set in the RADAR READY position. The +24 Vdc is routed through switch S11-A to the self-test circuitry of the SCG under test. With the correct range and range rate input, the test indicator lamp DS9 will light if self-test circuitry is operating properly.

(5) GROUND. When MODE switch (S11) is set to GROUND, no +24 Vdc signals are distributed to the SCG under test through the switch. The GROUND position of the switch is an open position. Operation of the SCG under test is via relay K1 and ACTION switch S9.

c. ACTION Switch. The ACTION switch provides simulation of the system's ACTION switches. When set to ON, +24 Vdc is applied to the SCG under test in the same manner as the system's ACTION switches. The K22 ACTION SWITCH indicator DS3 and ANTENNA SERVO COMMAND indicator DS5 receive a +24 Vdc signal from the SCG under test when SCG K22 relay is energized. This +24 Vdc signal lights both DS3 and DS5 indicators.

d. Range and Range Rate Potentiometers. The SCG test panel contains two potentiometers to simulate the system's radar range and radar range rate signals and two potentiometers to

Table 3-1. Sight Current Generator (SCG) Panel Test Points

SCG test panel test point	Corresponding SCG test point	Signal or voltage monitored
1	J4-A	+19 Vdc from test panel.
2	J4-B	+19 Vdc return from test panel.
3	J4-F	280 V p-p, 400 Hz, quasi-squarewave center tap from test panel.
4	J4-H	280 V p-p, 400 Hz, quasi-squarewave from test panel.
5	J4-G	280 V p-p, 400 Hz, quasi-squarewave from test panel.
6	J1-C	115 Vac, 400 Hz from test panel.
7	J1-B	115 Vac, 400 Hz return from test panel.
8	-	Test panel 24 Vdc bus.
9	J1-S	0 to +15 Vdc manual range input from test panel MANUAL RANGE/METERS potentiometer.
10	J1-T	0 to +15 Vdc manual range rate input from test panel MANUAL RANGE RATE/KNOTS potentiometer.
11	J6-e	+20 Vdc from test panel.
12	J6-J	+10 Vdc from test panel.
13	J6-K	-10 Vdc from test panel.
14	J6-N	+10 to -10 Vdc radar range rate input from test panel RADAR RANGE RATE potentiometer or SCG SERVO test panel.
15	J6-L	0 to +10 Vdc radar range input from test panel RADAR RANGE potentiometer or SCG SERVO test panel.
16	J3-B	0 to -15 Vdc gun elevation input (cos ϕ) from test panel COSINE potentiometer.
17	J3-X	$\lambda^3E^IM^2$ input from test panel λ^3E cup on LEAD ANGLE EL potentiometer.
18	J3-H	$\lambda^2\lambda E$ input from test panel λE cup on LEAD ANGLE EL potentiometer.

Table 3-1. Sight Current Generator (SCG) Panel Test Points - Continued

SCG test panel test point	Corresponding SCG test point	Signal or voltage monitored
19	J3-V	λ^2E input from test panel λ^2E cup of LEAD ANGLE EL potentiometer.
20	J3-L	λ^2T input from test panel λ^2T cup on LEAD ANGLE TRAVERSE potentiometer.
21	-	Test panel - 23 Vdc bus.
22	J7-P	AzϕB synchro test point on SCG*.
23	J7-R	AzϕC synchro test point on SCG*.
24	J7-S	ElϕA synchro test point on SCG*.
25	J7-T	ElϕB synchro test point on SCG*.
26	J7-U	ElϕC synchro test point on SCG*.
27	J7-C	24 Vdc signal to SCG 10 sec time delay circuitry.
28	J7-B	SCG 115 Vac, 400 Hz, return.
29	J7-A	SCG 115 Vac, 400 Hz.
30	J7-D	SCG λ^2T signal from antenna traverse circuit.
31	J7-E	SCG λ^2E signal from antenna elevation circuit.
32	J7-F	Lock on signal applied to SCG by test panel LOCK ON switch. (0V = LOCK ON)
33	J7-G	ECM signal applied to SCG by test panel ECM switch. (NO ECM = +13V)
34	J7-H	SCG -10 Vdc inbound range rate reference.
35	J7-J	SCG +10 Vdc outbound range rate reference.
36	J7-K	SCG +20 Vdc range reference.
37	J7-L	Radiate command signal applied to SCG by test panel FOOT SWITCH.
38	J7-M	SCG radar ready signal.
39	J7-N	AzϕA synchro test point on SCG*.
40	J7-V	SCG $F(I_T)$, torque motor current feedback.

Table 3-1. Sight Current Generator (SCG) Panel Test Points - Continued

SCG test panel test point	Corresponding SCG test point	Signal or voltage monitored
41	J7-W	SCG $F(I_M)$, magnet current feedback.
42	J7-X	SCG ground.
43	J7-Y	SCG -15 Vdc.
44	J7-Z	SCG +15 Vdc.
45	J7-a	SCG cos θ signal.
46	J7-c	SCG $\lambda^{3}E^{I}M^{2}$ signal. (Torque command second term)
47	J7-d	Sight cage signal applied to SCG by test panel SIGHT CAGE switch.
48	J7-f	SCG range greater than 2200 signal.
49	J7-g	SCG VI_M, magnet current module input.
50	J7-h	SCG VI_T, torque motor current module input.
51	J7-i	SCG -3.4 volts air density reference voltage.
52	J7-j	SCG VI_M fifth term. MV (terms 1, 2, 3, and 4).
53	J7-k	SCG same as TP52.
54	J7-m	SCG VI_M first term, +1/RN.
55	J7-n	SCG VI_M fourth term, $-\lambda^2/R$.
56	J7-p	SCG VI_T third term, superelevation.
57	J7-q	SCG divider reference.
58	J7-r	SCG rescaled range +R.
59	J7-s	SCG VI_M third term $+R/R^2$.
60	J7-t	SCG $\phi 1$.
61	J7-u	SCG VI_M second term -R/R.
62	J7-v	SCG test mode low calibration limit signal.
63	J7-w	SCG test mode high calibration limit signal.

Table 3-1. Sight Current Generator (SCG) Panel Test Points - Continued

SCG test panel test point	Corresponding SCG test point	Signal or voltage monitored
64	J7-x	SCG range input from radar.
65	J7-y	SCG range signal buffered (R).
66	J7-z	SCG 24 Vdc K14 acquisition time delay (ATD) signal.
67	J7-AA	SCG range rate signal.
68	J7-BB	SCG $+KI_M^2$ signal.
69	J7-CC	SCG acquisition time delay signal.
70	J7-DD	SCG $F(I_M)$, magnet current feedback, buffered.
71	J7-EE	SCG $- KI_M^2\lambda^2$ signal.
72	J7-FF	SCG λ^2 signal
73	J7-GG	SCG 26 V p-p serrasoid wave signal.
74	J7-HH	SCG sight cage signal test point.
75	J7-b	SCG ready-to-fire signal.
76	J7-3	SCG K27 (ready-to-fire) relay actuation signal.
77	J3-a	Test panel ground through SCG.
78	J2-R	Same as TP24*.
79	J2-S	Same as TP25*.
80	J2-J	Same as TP26*.
81	J2-F	Same as TP39*.
82	J2-H	Same as TP22*.
83	J2-G	Same as TP23*.
84	J3-U	SCG 115 Vac, 400 Hz.
85	J3-D	SCG 115 Vac, 400 Hz return.
86	J1-Z	Same as TP66.
87	J2-P	Magnet current return.

Table 3-1. Sight Current Generator (SCG) Panel Test Points - Continued

SCG test panel test point	Corresponding SCG test point	Signal or voltage monitored
88	J6-d	±10 Vdc and +20 Vdc return from test panel.
89	-	Test panel ground.
90	-	Test panel test point for sight cage sensing circuitry.
91	J2-D	SCG $F(I_M)$, same as TP41.
92	J2-K	SCG $F(I_T)$, same as TP40.

*Signal from system sight present only when SCG connected in system.

simulate manual range and range rate signals to the SCG under test. Pin 1 of the RADAR RANGE (R7) and Pin 1 of the RADAR RANGE RATE (R6) potentiometers are connected to ±10 Vdc return. RADAR RANGE R7-3 is connected to +10 Vdc while RADAR RANGE RATE R6-3 is connected to -10 Vdc. The variable output of radar range is applied to the outbound side of switch S14 and to the normally closed contacts of RANGE GREATER THAN 3000M momentary pushbutton switch S8. When switch S8 is depressed, the output of radar range is inhibited and +15.4 Vdc is applied to the SCG under test, indicating range is greater than 3000 meters. The output of radar range rate (R6) is applied to the inbound position of switch S8. Radar range is a variable voltage of +10 to zero Vdc, radar range rate is -10 to zero Vdc. When switch S14 is set to the OUTBOUND position, radar range and range rate signals applied to the SCG under test are the same. The MANUAL RANGE/METERS AND MANUAL RANGE RATE/KNOTS potentiometers receive their operating voltage (+15 Vdc) from the SCG under test. The MANUAL RANGE/METERS, R2, and RANGE RATE/KNOTS, R4, potentiometers are used when the SCG under test is in the manual mode of operation.

e. RANGE/RANGE RATE Switch. The RANGE/RANGE RATE switch when set to AUTO energizes relay K3. Relay K3 applies range and range rate data, received from the SCG servo test panel, to the sight current generator under test.

f. Lead Angle and Cosine Potentiometers. The SCG test panel contains two lead angle potentiometers, LEAD ANGLE TRAVERSE (R1) and LEAD ANGLE EL (R5), and a COSINE potentiometer (R3). The two lead angle potentiometers provide simulated systems radar antenna traverse angle inputs to the SCG under test. The COSINE potentiometer provides simulation of the system's cannon elevation potentiometer.

(1) Traverse Lead Angle Potentiometer. The LEAD ANGLE TRAVERSE potentiometer operates on -15 Vdc received from the SCG under test. The output can be varied from zero Vdc (center position) to -15 Vdc rotation in either direction since it can be rotated 360°. The potentiometer output is applied to the SCG under test through the normally closed contacts of the LEAD ANGLE GREATER THAN 25° momentary action pushbutton switch (S5). Depressing the LEAD ANGLE GREATER THAN 25° switch applies -8.5 Vdc from A1R13 and A1R14 resistor voltage divider to the SCG under test in place of the LEAD ANGLE TRAVERSE potentiometer output. The -8.5 Vdc is applied to both the traverse and elevation inputs, which together give a lead angle greater than 25°.

(2) Elevation Lead Angle Potentiometer. The LEAD ANGLE EL potentiometer (R5) contains three cups. Each cup is actually a separate potentiometer and the three are ganged together. Cup 1 operates on a reference voltage from the SCG under test. The output signal is dependent on the angle to which the LEAD ANGLE EL potentiometer is set, and the value of the SCG input signal. When set to the center position (a simulated zero elevation lead angle), the cup output is 0 Vdc. Cup 2 operates on -15 Vdc supplied from the SCG under test. The output can be varied from 0 Vdc (a simulated zero elevation lead angle) to -15 Vdc (the potentiometer maximum elevation lead angle signal). The cup output is applied to the SCG under test through the NC2 normally closed contacts of the LEAD ANGLE GREATER THAN 25° momentary action pushbutton switch (S5). Depressing the LEAD ANGLE GREATER THAN 25° switch applies -8.5 Vdc to the SCG under test in place of the LEAD ANGLE EL cup 2 potentiometer output. The -8.5 Vdc is applied to both the

elevation and traverse inputs, which together give a lead angle greater than 25°. Cup 3 operates on a reference voltage from the SCG under test. The output signal is dependent on the angle to which the LEAD ANGLE EL potentiometer is set and the reference voltage input from the SCG under test. When set to the center position (a simulated zero elevation lead angle), the cup output is 0 Vdc.

(3) COSINE Potentiometer. COSINE potentiometer operates on -15 Vdc supplied by the SCG under test. The output can be varied from -15 Vdc (center positon) to 0 Vdc (rotation in either direction since the potentiometer can be rotated 360°). The -15 Vdc represents a simulated system cannon elevation of zero degrees and the 0 Vdc represents a simulated system maximum cannon elevation.

g. Magnet and Torque Motor Load Circuits. The magnet and torque motor load circuits are provided to simulate E1 system sight loads on the SCG under test. The sight cage test circuitry is used to check out the operation of the SCG sight cage circuitry.

(1) Magnet Load Circuit. The magnet load circuit consists of magnet assembly A2, resistor R11, and diode CR4. The circuit exactly simulates a system sight magnet load circuit. The circuit loads the magnet current module (A13) output from the SCG under test. TEST POINT 87 is provided to allow circuit feedback signal to the SCG under test to be monitored.

(2) Torque Motor Load Circuit. The torque motor load circuit consists of torque motor assembly A3 and resistor A1R12. The circuit exactly simulates a system sight torque motor load circuit. The circuit loads the torque motor current module (A14) output from the SCG under test. TEST POINT 92 is provided to allow the circuit feedback signal to the SCG under test to be monitored.

h. Sight Cage Test Circuitry. The sight cage test circuits consist of the SIGHT CAGE BUTTON switch (S10) and the sight cage sensing circuitry connected to the magnet load circuit. When MODE switch (S11-B) is set to either RADAR READY, K26 MANUAL, K25 EXTERNAL, or TEST, +24 Vdc is applied to the normally open contacts of SIGHT CAGE BUTTON momentary action pushbutton switch (S10). When the SIGHT CAGE BUTTON switch is depressed, relay K24 in the SCG under test is energized. Energizing SCG relay K24 causes a sight cage output voltage to be applied by the SCG under test to the magnet load circuitry in the SCG test panel. The sight cage sensing circuitry senses the sight cage voltage on the magnet load circuitry and causes SIGHT CAGE indicator (DS11) to light. When the sight cage voltage is applied to the magnet load circuit, the voltage at TEST POINT 91 goes to approximately -1.7 Vdc. The -1.7 Vdc, applied through resistor A1R22 and diode A1CR5, causes transistor A1Q2 to turn on. When A1Q2 turns on, transistor A1Q3, which was on, is turned off. When A1Q3 is turned off, A1Q4 turns on applying a ground to SIGHT CAGE indicator (DS11). When A1Q3 was on, it kept transistor A1Q4 turned off. When the ground is applied through A1Q4, the SIGHT CAGE indicator lights, indicating there is sight cage current from the magnet current module. TEST POINT 90 is provided to allow the operation of the sight cage sensing circuitry to be monitored if necessary.

i. Ready-to-Fire Test Circuit. When MODE switch (S11-C) is set to RADAR READY, K26 MANUAL, K25 EXTERNAL, or TEST, +24 VDC is applied through the SCG under test to the READY TO FIRE (RTF) indicator (DS1) on the SCG test panel. When the SCG test panel ACTION SWITCH (S9-C1) is set to ON, a +24 Vdc is applied through the SCG to the K27 READY TO FIRE indicator (DS4). The +24 Vdc applied to READY TO FIRE indicator (DS1) is also routed through the SCG and applied to A1R15, A1R16 resistor network, and capacitor A1C1. The +24 Vdc divided across A1R15 and A1R16 causes capacitor C1 to charge to firing voltage of A1Q1 causing silicone controlled rectifier (SCR) A1Q1 to turn on. When SCR A1Q1 turns on, a ground is applied through the SCR to K27 READY TO FIRE indicator (DS4), causing it to light. The indicator will now remain lit until ACTION SWITCH (S9-C1) is set to OFF. When the SCG RTF output is a ground, the READY TO FIRE indicator will light. The RTF output is set to ground within the SCG by various means depending on the mode of operation of the SCG under test.

j. Ready to Fire Analysis. The checking of the SCG under test ready to fire circuits provides much of the checkout of the SCG.

(1) Radar Mode. When the SCG under test is being checked out in a simulated system radar mode of operation, the RTF output is controlled by the SCG firing indicator (A5) circuits. Setting LOCK ON switch (S2) to ON simulates a system radar lock on signal to the SCG under test, activating the acquisition time delay (ATD) circuits. The simulated radar lockon signal is an open circuit (removal of +15 Vdc). Once the SCG acquisition time delay is completed, the firing indicator (A5) circuit RTF output in the SCG under test goes to ground. This causes READY TO FIRE indicator (DS1) to light. TEST POINT 86 is provided to check one of the SCG (ATD) output signals. Depressing LEAD ANGLE GREATER THAN 25° momentary action pushbutton switch (S5) applies -8.5 Vdc signals from the A1R13 and A1R14 resistor voltage divider to the SCG under test in place of the SCG panel simulated radar antenna lead angle potentiometer outputs $\lambda^2\tau$ and $\lambda^2\Sigma$. The -8.5 Vdc is applied to both the elevation and traverse inputs, which together give a lead angle greater than 25°. The signals are combined and applied through circuits in the SCG under test to the SCG firing indicator (A5). When the signal is applied to the SCG firing indicator circuits, it causes the RTF output to open (from ground). The open circuit causes the SCG test panel READY TO FIRE indicator (DS1) to go out. The READY TO FIRE indicator will remain out as long as the LEAD ANGLE GREATER THAN 25° switch is held depressed. The switch provides the means to check the lead angle greater than 25° portions of the ready-to-fire circuits in the SCG under test. Depressing ELEVATION GREATER THAN 80° momentary action pushbutton switch (S7) applies a simulated system cannon elevation greater than the 80° signal to the SCG under test. The simulated signal is an open circuit (removal of a ground). The elevation greater than 80° signal is also applied through circuits in the SCG under test to the SCG firing indicator (A5) circuits, causing the output of the circuits to go to an open condition. The open condition causes the SCG test panel READY TO FIRE indicator (DS1) to go out. The READY TO FIRE indicator will remain out as long as the ELEVATION GREATER THAN 80° switch is held depressed. Depressing RANGE GREATER THAN 3000 M momentary action pushbutton switch (S8) applies +12.3 Vdc from the A1R9, A1R10 resistor voltage divider to the SCG under test in place of the SCG test panel simulated system radar range signal input. The +12.3 Vdc simulates a radar range signal input of greater than 3000 meters. The signal is applied through circuits in the SCG under test to the SCG firing indicator (A5) circuits. The range greater than 3000 M signal (as in the case of the lead angle greater than 25° and the elevation greater than 80° signals) causes the firing indicator circuits RTF output to go to an open condition, and the SCG test panel READY TO FIRE indicator to go out. The READY TO FIRE indicator will remain out as long as the RANGE GREATER THAN 3000 M switch is held depressed. Depressing ECM momentary action pushbutton switch (S4) applies a simulated system radar ECM signal to the SCG under test. The simulated ECM

signal is a ground. The signal is also applied to the firing indicator (A5) circuits in the SCG under test. The ECM signal causes the firing indicator RTF output to oscillate. The oscillating RTF output causes the SCG test panel READY TO FIRE indicator to blink. The READY TO FIRE indicator will blink as long as the ECM switch is held depressed.

(2) Manual Mode. When the SCG under test is being checked out in a simulated system manual mode of operation, the SCG RTF output is set to ground through relay switching. In simulated manual mode of operation (refer to fig. FO-2) relays K26, K23, and K27 in the SCG under test are energized. Energizing the relays sets the SCG RTF output to ground, causing READY TO FIRE indicator (DS1) to light.

(3) External Mode. When the SCG under test is being checked out in a simulated system external mode of operation, the SCG RTF output is set to ground through SCG relay switching and the SCG test panel EXTERNAL READY TO FIRE switch (S6). In simulated external mode of operation relays K25, K23, and K27 in the SCG under test are energized. Depressing EXTERNAL READY TO FIRE momentary action pushbutton switch (S4), then sets the SCG RTF output to ground causing READY TO FIRE indicator (DS1) to light. The READY TO FIRE indicator will remain lit as long as the EXTERNAL READY TO FIRE switch is held depressed.

(4) Foot Switch Test Circuit. When MODE switch (S11-D) is set to RADAR READY, or TEST, and the action switch relay K22 in the SCG is energized, +24 Vdc is applied through the SCG under test to FOOT SWITCH (S13). When the FOOT SWITCH is set to ON, a simulated +24 Vdc foot switch signal is applied to the SCG under test. The signal is routed through the SCG back to the SCG test panel, causing RADIATE COMMAND indicator (DS10) to light.

3-6. Distribution Box Panel 2A1A2.

a. Functional Flow Analysis. The distribution box panel is used to check out and fault isolate the system distribution box (DB) assembly. The DB under test is mated to the test panel assembly with test cables (fig. 1-4). Switches and test circuitry in the test panel assembly are used to simulate system inputs and loads. Indicators and test points on the test panel assembly are provided to monitor the operation of the DB being tested. Two coaxial test connectors, on the front of the test panel assembly, allow selected DB relay switching signals to be connected with test cables to the AN/TSM-100 counter (2A2A3) so that time delays between the relays being energized or deenergized can be accurately measured, if desired, during the DB checkout procedures.

(1) The +24 Vdc power distribution to the system DB under test and to the test panel assembly itself is interlocked through the test panel assembly +5 Vdc power switch. The +24 Vdc power cannot be distributed until +5 Vdc power has been distributed to the test panel assembly circuits. The +24 Vdc applied to the DB under test simulates systems battery power inputs to the DB.

(2) System power action switch, gun power, and trigger test circuits provide the means to simulate distribution of system operating power to the DB under test. The circuits simulate system control panel and grip assembly signals to the DB under test. Indicators on the test panel assembly show whether the DB under test is responding properly to the simulated inputs. Operating power for the test circuits is distributed from the DB under test as it would in actual system operation.

(3) The test panel assembly contains test circuits to check out operation of each relay in the DB under test. Some

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of the test circuits also provide a means to check time delays associated with various DB relays being energized or deenergized during the checkout procedures. Indicators on the test panel assembly show whether the DB relays are operating properly.

NOTE

> Detailed descriptions of the operation of logic module gates, inverters, and latch circuits within the DB test panel circuits are contained in section III of this chapter.

(4) Test circuits to check out wiring continuity in the DB under test are also provided. The test panel assembly RELAY TIME SELECTORS rotary switches provide a means to check the signals at the DB test connector and each DB test panel input and output signal. The switches also provide a means to make resistance measurements between selected DB connector pins. Setting the switches to appropriate positions connects the signal being checked to the coaxial test connectors or test points jacks (TP6 to TP9) on the test panel assembly. Refer to figure FO-7 for the appropriate switch settings that allow each signal to be monitored.

(5) Detailed analysis of the distribution box test panel assembly is separated into detailed descriptions of the functions described above. Operation of each relay test circuit is treated separately. Figure FO-7 is the distribution box test panel assembly detailed schematic diagram.

NOTE

> Components referenced in the following descriptions are in the AN/TSM-100 distribution box panel (2A1A2) unless otherwise stated.

b. Power Distribution. The distribution box panel (DB test panel) receives +24 Vdc and +5 Vdc power from the AN/TSM-100 power panel (2A1A3). The +24 Vdc power distribution to the DB under test and to the DB test panel is interlocked through the +5 VDC ON/OFF switch and must be set to ON in order for the +24 Vdc power to be distributed.

(1) +24 Vdc Distribution. If the +5 VDC ON/OFF switch (S15) is set to ON, +24 VDC ON/OFF switch (S16) controls application of +24 Vdc power to the DB under test and DB test panel circuits. When the +24 VDC ON/OFF switch (S16) is set to ON, +24 Vdc is applied directly to the DB under test and to the DB test panel circuits. The +24 VDC indicator (DS24) lights when the +24 Vdc is being applied. Circuit breaker CB1 (5A) provides overload protection. When +24 Vdc is applied to the DB test panel circuits, it is also applied to the resistor R1 and zener diode CR1 voltage regulating network. The regulating network provides +18 Vdc for the DB test panel circuits.

(2) +5 Vdc Distribution. When +5 VDC ON/OFF switch (S15) is set to ON, +5 Vdc is distributed to the DB test panel circuits. The +5 Vdc is used to operate the DB test panel logic circuitry. The +5 VDC indicator (DS23) lights when transistor A4Q8 is turned on. Transistor A4Q8 is turned on by the +5 Vdc through resistors A4R2 and A4R17. The 0.5 AMP fuse (F1) provides overload protection. The +5 Vdc also is applied through resistor A1R7 to test panel logic circuits. The RESET switch (S19) is used to reset the latching gates in the DB test panel logic circuits, by momentarily grounding the +5 Vdc through resistor A1R7. When the RESET switch is pressed, the signal is grounded. This ground causes the logic circuit latching gates to reset.

c. System Power and Action Switch Test Circuits. The DB test panel SYSTEM POWER ON/OFF switch (S6) and ACTION SWITCH ON/OFF switch (S5) simulate system power and action switch signals to the DB under test. Both switches operate on +24 Vdc distributed from the DB under test.

(1) SYSTEM POWER ON/OFF SWITCH (S6). When SYSTEM POWER ON/OFF switch (S6) is set to ON, +24 Vdc is applied to system power relay K2 in the DB under test. Energizing DB relay K2 applies +24 Vdc to K2 indicator (DS3), causing it to light.

(2) ACTION SWITCH ON/OFF SWITCH (S5). When ACTION SWITCH ON/OFF switch (S5) is set to ON, relay K3 in the DB under test is energized. Energizing DB relay K3 applies a ground through the DB under test to K3 indicator (DS4), causing it to light. If the NORM-STATIC-TEST switch on the DB under test is set to NORM or TEST, relay K4 in the DB under test also is energized. Energizing DB relay K4 applies +24 Vdc to K4 indicator (DS5) ELEVATION AMPL indicator (DS14), AZIMUTH AMPL NO. 1 indicator (DS15), and AZIMUTH AMPL NO. 2 indicator (DS16), causing them to light.

d. Gun Power and Trigger (K5) Test Circuits. GUN POWER ON/OFF switch (S3) and TRIGGER ON/OFF switch (S9-C2) simulate gun power and trigger signals to the DB under test.

(1) GUN POWER ON/OFF SWITCH (S3). When relay K2 in the DB under test is energized, +24 Vdc from the DB is applied to GUN POWER ON/OFF switch (S3). Setting the GUN POWER ON/OFF switch (S3) to ON distributes the +24 Vdc to the DB under test.

(2) TRIGGER ON/OFF SWITCH (S9-C2). TRIGGER ON/OFF switch (S9-C2) controls the +24 Vdc from the DB under test, when DB relay K3 is energized and GUN POWER ON/OFF switch (S3) is set to ON. The +24 Vdc is routed from the GUN POWER ON/OFF switch (S3), through the DB under test, to the DB test panel LAST ROUND ON/OFF switch (S1-C1). The LAST ROUND ON/OFF switch (S1) should be left in the off position. In the off position the +24 Vdc is routed through the energized DB relay K3 contacts to the TRIGGER ON/OFF switch (S9-C2).

(a) Setting the TRIGGER ON/OFF switch (S9-C2) to ON energizes relay K5 in the DB under test. The simulated trigger signal is routed back through the DB test panel before causing DB relay K5 to energize. Energizing DB relay K5 applies +24 Vdc from the DB under test to K5 indicator (DS1) and BRAKE indicator (DS12), causing them to light. The J12 connections simulate the system DB arming connector connections.

(b) The +24 Vdc signals that cause the indicators to light also cause transistors A7Q1 and A7Q4 to turn on. The transistors provide indications of the K5 and BRAKE relay switching signals to INPUT A and INPUT B coaxial test connectors, J18 and J19. The signals are applied through RELAY TIME SELECTORS rotary switches (S17-A and S18-A). Setting the RELAY TIME SELECTORS CHANNEL A or CHANNEL B rotary switches to the appropriate positions allows the K5 or BRAKE relay switching indications to be monitored at either of the coaxial test connectors. The relay switching indications are normally +24 Vdc through resistors A7R1 and A7R4. When either transistor A7Q1 or A7Q4 is turned on, the appropriate switching indication is switched to a ground by the conduction of the transistor.

(c) Resistor A7R16 and capacitor A7C1 filter the +24 Vdc used in the DB test panel A7 circuit card assembly circuits.

e. K6 (Firing Volts) Test Circuits.

(1) General. The primary test circuits are logic circuits contained on the DB test panel K6 operation and sequence circuit card A4 assembly. The logic circuits control the operation of K6

indicator (DS2). The K6 indicator will light when the K6 relay in the DB under test is energized. Proper operation of the K6 relay in the DB under test is checked by setting up test conditions to extinguish the K6 indicator. The K6 indicator goes off if the DB relay K6 deenergizes after remaining on at least 400 ms after any of the following test conditions have occurred:

(a) TRIGGER ON/OFF switch (S9) is set to OFF.

(b) BURST LIMIT ON/OFF switch (S10) is set to ON.

(2) DB Relay K6 Energization. The +24 Vdc is applied to one side of the DB K6 relay when the DB test panel GUN POWER ON/OFF switch (S3) is set to ON. DB K6 relay is energized when a ground is applied to the other side of the K6 relay through the K6 time delay circuit in the DB under test. A +24 Vdc signal, through the DB test panel LAST ROUND switch (S1-C1) and DB relay K5 and K3 contacts, causes the DB relay K6 to energize. The +24 Vdc signal is applied when DB relays K3 and K5 are energized. DB relays K3 and K5 are energized by the DB test panel ACTION/SWITCH (S5) and TRIGGER and GUN POWER ON/OFF switches (S9-C2) and S3) being set to ON. DB relay K6 energizes immediately when the +24 Vdc signal is applied to its deactivating time delay circuit, and remains energized a short time (its deactivating time delay) after the signal is removed.

(3) Lighting K6 Indicator. When +24 Vdc is applied through the DB test panel J12 connector to the K6 relay in the DB under test, it is also applied through the A2R19 and A2R20 resistor voltage divider network to the A3A1-M gate input. The A2R19 and A2R20 voltage divider reduces the +24 Vdc to +5 Vdc (a logic 1).

(a) The signal applied to the A2R1 and A2R2 resistor voltage divider from the DB under test is initially +24 Vdc and goes to ground when DB relay K6 is energized. When the signal from the DB under test is +24 Vdc, the A2R1 and A2R2 voltage divider reduces the voltage to a logic 1.

(b) Inverter A3A1 (HK) inverts the logic 1 and applies a logic 0 to the A3A1-L gate input. A logic 1 and logic 0 at the A3A1-M and L gate inputs sets the gate output, (K6), to a logic 1. A logic 1 (K6) signal will not permit the K6 indicator (DS2) to light.

(c) When DB relay K6 is energized, 0 Vdc (a logic 0) is applied to inverter A3A1 (HK). A3A1 (HK) inverts the logic 0 and applies a logic 1 to the A3A1-L gate input. Two logic 1 inputs at A3A1-M and L set the gate K6 output to a logic 0. A logic 0 (K6) signal causes the K6 indicator to light.

NOTE

All circuit components in the following description of the K6 test circuits are on the DB test panel K6 operation and sequence circuit card assembly A4 unless otherwise noted.

(d) When the K6 signal input to the DB test panel K6 operation and sequence A4 circuit card assembly goes to a logic 0, the K6 ON logic latch circuit, A1(ABE) and A2(LKMN), output at A1N is set to a logic 0. The logic 0 output causes transistor Q4 to turn off. The K6 ON latch circuit output was previously at a logic 1 and Q4 was turned on. When Q4 turns off, transistor Q5 turns on, applying a ground to K6 indicator DS2. The ground causes the K6 indicator to light, showing that relay K6 in the DB under test is energized.

(e) The K6 ON logic latch circuit output latches to a logic 0, keeping the K6 indicator lit. The K6 indicator will remain lit until a reset signal (logic 0), either at A2-M or A2-K, resets the latch. Both the A2-M and A2-K inputs are normally at a logic 1. The A2-M input is connected to the DB test panel RESET switch (S19). The A2-K input is from the K6 operation and sequence logic circuits that check proper operation of DB relay K6.

(4) Extinguishing K6 indicator (TRIGGER ON/OFF switch (S9) on the DB test panel set to OFF) deenergizes DB relay K5. Deenergizing DB relay K5 causes DB relay K6 to deenergize after a slight delay (its time delay is approximately 0.5 second).

(a) When the TRIGGER ON/OFF switch (S9) is set to OFF, a logic 0 is applied to the A3-A gate input, causing the gate output, A3-E, to go to a logic 1. Previously, all the inputs to the A3 (ABCE) gate were at a logic 1 and the output was at a logic 0.

(b) When A3-E is set to 1, A4 (HK) inverts the signal and applies a logic 0 (0 Vdc) input to transistor Q1. Q1 is turned off by the 0 Vdc input (previously it was on). When Q1 turns off, capacitor C3 begins being charged through resistor R11. R11 is selected to obtain a time delay of 0.5 second from the time Q1 is turned off (TRIGGER ON/OFF switch (S9) set to OFF) to the time the voltage charge on C3 triggers unijunction transistor Q2. When Q2 is triggered, transistor Q3 is momentarily turned on applying a 0 Vdc (logic 0) input signal at A3-M to the TIME DELAY COMPLETE latch circuit A3(MLN) and A3(HGFI). If the latch A3-G input is still at a logic 1 (the TRIGGER ON/OFF switch (S9) is still set to OFF), the latch output at A3-I latches to a logic 0. The latch circuit output was previously at a logic 1 (set by a logic 0 at A3-G when the TRIGGER ON/OFF switch (S9) was set to ON). The logic 0 latched at A3-I indicates that the time delay has been completed.

(c) Inverter A4(AC) inverts the logic 0 latched at A3-I and applies a logic 1 to the A4-M gate input. Inverter A4(FG) inverts the K6 signal being applied to the logic circuits and applies it to the A4-L gate input.

(d) The A4(MLN) gate assures that DB relay K6 has remained energized for at least as long as the time delay in the test circuitry. When DB relay K6 is deenergized, the level at A4-L is a logic 0. If DB relay K6 deenergizes before the TIME DELAY COMPLETE latch has caused a logic 1 to be applied to A4-M, through inverter A4(AC), the gate output at A4-N remains a logic 1. A logic 1 at A4-N will not cause the K6 ON AFTER TIME DELAY latch, A2(EFG) and A2(ABC), to change its output state. The latch output at A2-G will remain a logic 0.

(e) If DB relay K6 is still energized (the K6 signal is a logic 0) after the TIME DELAY COMPLETE latch has caused a logic 1 to be applied to A4-M, Logic 1 signals at A4-M and A4-L through A4 (FG) cause the gate output to go to a logic 0. A logic 0 at A4-N causes the K6 ON AFTER TIME DELAY latch output at A2-G to latch to a logic 1. The logic 1 latched at A2-G indicates that DB relay K6 remained energized at least as long as the test circuit time delay.

(f) The A1 (FHI) gate makes sure DB relay K6 has deenergized before the K6 indicator goes out. The logic 1 latched at A2-G is applied to the A1-H gate input. If DB relay K6 is deenergized, the K6 signal at A1-F also is set at a logic 1. The two logic 1 inputs at A1-F and H cause the gate output to go to a logic 0. The logic 0 is applied to the A1-K gate input in the K6 ON latch circuit, causing the K6 ON latch to reset and the K6 indicator to go out. If DB relay K6 failed to deenergize, the K6 signal at A1-F would remain a logic 0, and the K6 ON latch could not be reset. The K6 indicator would remain lit.

(g) When the logic 0 is applied to A2-K, the latch output at A2-N goes to a logic 1. The logic 1 signal causes transistor Q4 to turn on. When Q4 turns on, Q5 is turned off. When Q5 is turned off, the ground is removed from the K6 indicator and it goes out.

(h) The RESET input, from the DB test panel RESET switch, is used to reset the logic latch circuits for each sequence of the DB relay K6 checkout procedures.

(5) Extinguishing K6 Indicator BURST LIMIT Switch ON. Setting the BURST LIMIT ON/OFF switch (S10) on the DB test panel to ON energizes relay K7 in the DB under test (described in paragraph 3-6h). Energizing DB relay K7 causes DB relay K5 to deenergize, and in turn causes DB relay K6 to deenergize. The K6 indicator will go out if DB relay K6 deenergizes after remaining on at least 0.5 second after the BURST LIMIT ON/OFF switch (S10) is set to ON. The operation of the logic circuits that check proper deenergization of DB relay K6 is the same as when the TRIGGER ON/OFF switch (S9) is set to OFF as described previously. The only difference is, when the BURST LIMIT switch is set to ON, the logic 0 signal that activates the time delay test circuitry is applied at the A3-B gate input.

(6) Noise Suppression. Resistor R1 and capacitor C1 filter the +18 Vdc used by the K6 operation and sequence A4 circuit card assembly circuits. Resistor R2 and capacitor C2 filter +5 Vdc used by the circuit card assembly circuits. Capacitors A8C3, A8C4, and A8C5 are noise suppression capacitors on the logic circuit latches to make sure that the latches are not accidentally set by electrical noise on the signals in the logic circuits.

(7) RELAY TIME SELECTORS Operation. The Q6, Q7 transistor network controls the K6 relay switching indication signal applied to INPUT A and INPUT B coaxial test connectors. J18 and J19, through RELAY TIME SELECTORS rotary switches (S17-A and S18-A). Setting the switches to the appropriate positions allows the K16 relay switching indication signal to be monitored at either of the test connectors. The signal is normally +18 Vdc, and goes to 0 Vdc when the K6 signal to the transistor network goes to a logic 0 (DB relay K6 energized). Q6 is turned off by the logic 0 signal (previously it was on) turning Q7 on, and causing the K6 relay switching indication signal to switch to a ground. When DB relay K6 is deenergized again the K6 signal is a logic 1. The logic 1 signal turns Q6 and Q7 off causing the K6 relay switching indication signal to go to +18 Vdc.

(8) FIRE VOLTS. When DB relay K6 is energized the DB A3 converter 350 Vdc firing volts output is applied to the DB test panel FIRE VOLTS test points (TP1 and TP2). The DB A3 converter operates on the same +24 Vdc signal, from the DB test panel GUN POWER ON/OFF switch (S3) that is applied to the DB K6 relay.

f. K8 (HI Gun Motor) Test Circuits. Figure FO-7 is a schematic diagram of the DB test panel K8 (hi gun motor) test circuits.

(1) General. The primary test circuits are logic circuits contained on the DB test panel K8 operation and sequence A5 circuit card assembly. The logic circuits control the operation of K8 indicator (DS7).

(a) HI Rate. When the DB test panel RATE switch (S8) is set to HI, the K8 indicator will light when DB relay K8 is energized, and will go out when DB relay K8 is deenergized.

(b) LO Rate. When DB test panel RATE switch (S8) is set to LO, the K8 indicator will light if DB relay K8 energizes, remains energized at least 200 ms, and then deenergizes. The K8 indicator will remain lit until the DB test panel RESET switch is pressed, or DB relay K8 is energized again. If DB relay K8 is energized again, the K8 indicator will light when the relay is deenergized.

(2) DB Relay K8 Energization. DB relay K8 is energized when +24 Vdc is applied to it through the DB test panel LAST ROUND ON/OFF switch (S1-C1). The +24 Vdc is applied through K3, K5 and K7 relay contacts in the DB under test. DB relays K3 and K5 are energized by the DB test panel ACTION SWITCH and TRIGGER switch being set to ON. When the DB is being tested under simulated LO rate of fire conditions, DB relay K8 energizes for the first 200 ms after the DB test panel TRIGGER switch is set to ON, and then it deenergizes. DB relay K7 controls the operation of DB relay K8 in LO rate.

NOTE

Unless otherwise noted, all circuit components in the following description of the K8 test circuits are on the DB test panel K8 operation and sequence circuit card assembly A5.

(3) K8 Indicator Operation - HI Rate. The +24 Vdc signal that energizes DB relay K8 also is applied across the A2R13 and A2R14 resistor voltage divider network, as the K8 input signal, to the K8 operation and sequence A5 circuit card assembly logic circuits. The A2R13 and A2R14 voltage divider reduces the +24 Vdc to +5 Vdc (a logic 1). A logic 1 K8 signal indicates DB relay K8 is energized. The logic 1 input signal, with the RATE switch set to HI, causes the K8 indicator to light.

(a) The logic 1 K8 signal is inverted by A1 (HK), and a logic 0 applied to the A2(ABC)-A gate input. With RATE switch (S8-A) set to HI, the HI-LO signal applied to the A2-B gate input is +5 Vdc (a logic 1). The logic 0 and logic 1 inputs at A2-A and B set the gate output, A2-C, to a logic 1. The logic 1 at A2-C is applied to the A2 (LMN)-M gate input.

(b) Meanwhile, the logic 1 HI-LO signal also is inverted by A2 (EG) and a logic 0 is applied to the A2(HIK)-I gate input. The logic 0 at A2-I sets the gate output, A2-K, to a logic 1 (regardless of where the A2-H gate input is set). The logic 1 at A2-K is applied to the A2-L gate input.

(c) Two logic 1 inputs at the A2-L and M gate inputs cause the gate output, A2-N, to set to a logic 0. A logic 0 output from the A2(LMN) gate causes the K8 indicator (DS7) to light.

(d) The logic 0 output, 0 Vdc, at A2-N causes transistor Q5 to turn off (the gate output was previously at a logic 1 and Q5 was turned on). When Q5 turns off, transistor Q4 turns on, applying a ground to K8 indicator (DS7). The ground causes the K8 indicator to light, indicating that relay K8 in the DB under test is energized.

(e) When DB relay K8 is energized the K8 signal applied to inverter A1 (HK) changes from logic 1 to a logic 0. A ground through A2R14, DB relay K8 is deenergized by DB relay K3 or K5 being deenergized. A1 (HK) inverts the logic 0 and applies a logic 1 to the A2 (ABC)-A gate input. The input signal to the A2-B gate is also a logic 1 from the RATE switch.

(f) The two logic 1 inputs at the A2-A and B gate inputs cause the gate output A2-C to go to a logic 0. The logic 0 at A2-C is applied to the A2-M gate input and sets the gate output A2-N to a logic 1 (regardless of where the A2-L gate input is set). A logic 1 output from the A2(LMN) gate causes the K8 indicator (DS7) to go out.

(g) Q5 is turned on by the logic 1 at A2-N, causing Q4 to turn off. When Q4 turns off, the ground is removed from the K8 indicator and it goes out.

(4) K8 Indicator Operation - LO Rate. When the RATE switch is set to LO, operation of the K8 indicator is controlled through the K8 operation and sequence circuit card assembly time delay test circuitry.

(a) When DB relay K8 is energized, the logic 1 K8 signal is inverted by A1 (HK) and a logic 0 is applied to the K8 ON latch circuit. A1(MLN) and A1 (ABC), input A1-L. The logic 0 input causes the latch circuit output at A1-C to latch to a logic 0. The logic 0 latched at A1-C indicates that DB relay K8 is energized.

(b) The logic 0 output at A1-C (K8 ON latch) causes transistor Q1 to turn off (the K8 ON latch circuit output was previously at a logic 1 and Q1 was turned on). When Q1 turns off, capacitor C1 begins charging through resistors R3 and R4. R4 is selected to obtain a time delay of 200 ms from the time Q1 is turned off (DB relay K8 energized) to the time the voltage charge on C1 triggers unijunction transistor Q2. When Q2 is triggered, transistor Q3 is momentarily turned on and applies a 0 Vdc logic 0 input signal at A4-H to the TIME DELAY COMPLETE latch circuit A4(FHI) and A4(ABCE). The logic 0 input causes the latch circuit output at A4-E to latch to a logic 0. The logic 0 latched at A4-E indicates the time delay was completed. Inverter A1(EG) certifies proper operation of the TIME DELAY COMPLETE latch by inverting the logic 0 K8 ON latch output at A1-C and applying a logic 1 to the A4-B latch input.

(c) Inverter A4(KN) inverts the logic 0 latched at A4-E and applies a logic 1 to the A3-M gate input. The K8 signal (logic 1 when energized) being applied to the logic circuits is applied to the A3-L gate input.

(d) The A3(MLN) gate makes sure DB relay K8 has remained energized for at least as long as the time delay in the test circuitry. When DB relay K8 is deenergized, the K8 signal at A3-L goes to a logic 0. If DB relay K8 deenergizes before the TIME DELAY COMPLETE latch has caused a logic 1 to be applied to A3-M through inverter A4(KN), the gate output at A3-N is set to a logic 1. A logic 1 at A3-N will not cause the K8 ON AFTER TIME DELAY latch circuit, A3(ABC) and A3(EFG), to change its output state. The latch circuit output, at A3-C, will remain set at a logic 0.

(e) If DB relay K8 is not deenergized (the K8 signal is a logic 1) after the TIME DELAY COMPLETE latch has caused a logic 1 to be applied to A3-M, logic 1 signals at A3-M and L cause the gate output A3-N to go to a logic 0. A logic 0 at A3-N causes the K8 ON AFTER TIME DELAY latch output, at A3-C to latch to a logic 1. The logic 1 latched at A3-C indicates that DB relay K8 remained energized at least as long as the test circuit time delay.

(f) The A3(HIK) gate makes sure that DB relay K8 has deenergized before the K8 indicator is caused to light. The logic 1 latched at A3-C is applied to the A3-I gate input. If DB relay K8 does not deenergize (the K8 signal is a logic 1) the signal at the A3-H gate input is a logic 0, through inverter A1(HK). The logic 0 at A3-H sets the gate output at A3-K to a logic 1. A logic 1 at A3-K will not cause the K8 indicator to light.

(g) If DB relay deenergizes (K8 signal is a logic 0), the signal at the A3-H gate input goes to a logic 1 (through inverter A1-HK). The two logic 1 inputs at A3-I and H set the gate output at A3-K to a logic 0. A logic 0 at A3-K will cause the K8 indicator to light when the DB test panel RATE switch is set to LO.

(h) The logic 0 at A3-K is applied to the A2-H gate input. The A2-I gate input is a logic 1, through inverter A2 (EG), from the RATE switch. When the RATE switch is set to LO, the HI-LO logic signal applied to inverter A2(EG) is a ground or logic 0. Inverter A2(EG) inverts the logic 0 and applies a logic 1 to the A2-I gate input. The logic 1 and logic 0 signals, applied to A2-I and H gate inputs, set the gate output A2-K to a logic 1.

(i) The logic 1 at A2-K is applied to the A2-L gate input. The A2-M gate input (output at A2-C) is also a logic 1. The A2(ABC) gate output is set to a logic 1 by the A2-B gate input (the HI-LO logic signal) being a logic 0 (regardless of where the A2-A gate input is set).

(j) Two logic 1 inputs at the A2-L and M gate inputs cause the gate output at A2-N to set to a logic 0. A logic 0 output from the A2(LMN) gate causes the K8 indicator to light, as described previously.

(k) The K8 indicator will remain lit until the DB test panel RESET switch is pressed, or DB relay K8 is energized again. Pressing the RESET switch applies a logic 0 RESET signal input to the K8 operation and sequence logic latch circuits, resetting their outputs and causing the K8 indicator to go out. If DB relay K8 is energized again, the signal at the A3(HIK)-H gate input, through inverter A1(HK), goes to a logic 0 (the K8 signal is a logic 1). The A3-I gate input was previously latched to a logic 1. The logic 0 and logic 1 inputs at A3-H and I set the gate output at A3-K to a logic 1. The logic 1 at A3-K is applied to the A2-H gate input. The A2-I gate input is also a logic 1 (the HI-LO logic 0 signal inverted through A2(EG)). The two logic 1 inputs at A2-H and I set the gate output at A2-K to a logic 0. The logic 0 at A2-K is applied to the A2-L gate input, causing the gate output at A2-N to go to a logic 1 (regardless of where the A2-M gate input is set). A logic 1 at the A2-N gate output causes the K8 indicator to go out.

(l) If DB relay K8 deenergizes again after energizing a second time, the K8 indicator will light again. When DB relay K8 deenergizes, the signal at the A3(HIK)-H gate input is again set to a logic 1 and the gate output at A3-K sets to a logic 0. The logic 0 at A3-K causes the A2(HIK) gate output applied to A2-L to set to a logic 1. The A2-M gate input is set to a logic 1 by the A2(ABC) gate input at A2-B, the logic HI-LO signal being a logic 0. Two logic 1 inputs at A2-L and M cause the gate output to set to a logic 0 and the K8 indicator to light.

(5) Noise Suppression. Resistor R10 and capacitor C3 filter the +18 Vdc used by the K8 operation and sequence A5 circuit card assembly circuits. Resistor R9 and Capacitor C2 filter the +5 Vdc used by the circuit card assembly circuits. Capacitors A8C6, A8C8, and A8C9 are noise suppression capacitors on the logic circuit latches to make sure that the latches are not accidentally set by electrical noise on the signals in the logic circuits.

(6) RELAY TIME SELECTORS OPERATION. The A7Q3 transistor network controls the relay K8 switching indication signal applied to INPUT A and INPUT B coaxial test connectors, J18 and J19, through RELAY TIME SELECTORS rotary switches (S17-A and S18-A). Setting the switches to the appropriate positions allows the K8 relay switching indication signal to be monitored at either of the test connectors. The signal is normally +24 Vdc and goes to 0 Vdc when DB relay K8 is energized. A7Q3 is turned on by the +24 Vdc signal that activates DB relay K8, causing the K8

relay switching indication signal to switch to ground (0 Vdc).

(7) GUN MOTOR Indicator. Energizing DB relay K8 applies +24 Vdc from the DB under test to GUN MOTOR indicator (DS13), on the DB test panel, causing it to light. Energizing DB relay K10 will also cause the GUN MOTOR indicator to light. The DB test panel test circuits that energize DB relay K10 are described in paragraph g following.

g. K9 (LO Time Delay) and K10 (LO Gun Motor) Test Circuits.

(1) K9 Indicator Operation. The K9 indicator on the DB test panel lights when relay K9 in the DB under test is energized, and goes out when the relay is deenergized. Relay K9 in the DB under test is energized when RATE switch (S8-D) is set to LO.

(a) A +24 Vdc signal, through the DB test panel LAST ROUND switch (S1-C1) and DB relay K5 and K3 contacts, causes the K9 time delay circuit in the DB under test to apply a ground to one side of DB relay K9. When RATE switch (S8-D) is set to LO, +24 Vdc from the DB is applied to the opposite side of DB relay K9, causing it to energize.

(b) The ground applied to DB relay K9 is applied across the A2R5/A2R6 resistor voltage divider to inverter A3A2(AC); A3A2(AC) inverts the ground input, a logic 0, and applies a logic 1 to the A3A2-E gate input. When the RATE switch is set to LO, the +24 Vdc signal applied to DB relay K9 is applied across the A2R15/A2R16 resistor voltage divider to the A3A2-F gate input as a logic 1 input. Two logic 1 inputs at A3A2-E and F set the gate output at A3A2-G to a logic 0. A logic 0 at A3A2-G causes K9 indicator (DS8) to light.

(c) The logic 0, or ground, at A3A2-G causes transistor A3Q6 to turn off (the A3A2-G gate output was previously at a logic 1 and A3Q6 was turned on). When A3Q6 turns off, transistor A3Q7 turns on, applying a ground to the K9 indicator. The ground causes the K9 indicator to light, indicating that relay K9 in the DB under test is energized.

(d) The A3Q6/A3Q7 transistor network also controls the K9 relay switching indication signal applied to INPUT A and INPUT B coaxial test connectors, J18 and J19, through RELAY TIME SELECTORS rotary switches (S17-A and S18-A). The signal is normally +24 Vdc and goes to 0 Vdc when DB relay K9 is energized.

(e) When DB relay K9 deenergizes, the logic 1 inputs to the A3A2(EFG) gate change state. A logic 0 input at A3A2-E or F causes the gate output to set to a logic 1. A logic 1 at A3A2-G causes the K9 indicator to go out. A3Q6 is turned on, A3Q7 is turned off, and the ground applied to the K9 indicator is removed.

(f) The A2R15/A2R16 and A2R5/A2R6 resistor voltage dividers are used to drop the +24 Vdc signals from the DB under test to +5 Vdc (a logic 1) to operate the logic circuits. Resistor A3R1 and capacitor A3C1 filter the +18 Vdc used by the DB test panel relay sense and K12 operation circuit card assembly A3 circuits.

(2) K10 Indicator Operation. The K10 indicator on the DB test panel lights when relay K10 in the DB under test is energized, and goes out when the relay is deenergized. Relay K10 in the DB under test is energized. The +24 Vdc signal that energizes relay K10 in the DB under test causes K10 indicator (DS9) to light. Transistor A7Q2 controls the K10 relay switching indication signal applied to the INPUT A and INPUT B coaxial test connectors through RELAY TIME SELECTORS rotary switches (S17-A and S18-A). The signal is normally

24 Vdc and goes to 0 Vdc when DB relay K10 is energized. The same DB signal that lights the K10 indicator when DB relay K10 is energized switches 7Q2 on.

h. K7 (Burst Limit) Test Circuits. The K7 indicator on the DB test panel lights when relay K7 in the DB under test is energized, and goes out when the relay is deenergized. DB relay K7 is checked under two simulated system modes of operation, HI rate and LO rate. The simulated modes of operation are set up by the DB test panel RATE switch (S8).

(1) HI Rate. When RATE switch (S8) is set to HI and TRIGGER switch (S9-C2) is set to ON, +24 Vdc is applied through the TRIGGER switch and the RATE switch (S8-E) to one side of DB relay K7. Setting BURST LIMIT switch (S10-C2) to ON applies a +24 Vdc signal from the DB under test through the RATE switch (S8-B) to the K7 activating time delay circuit in the DB. After a slight delay, the DB activating time delay circuit causes DB relay K7 to energize by applying a ground to the other side. DB relay K7 will remain energized until the +24 Vdc being applied to it is removed.

(a) The +24 Vdc applied to DB relay K7 also is applied across the A2R17/A2R18 resistor voltage divider to the A3A2-M gate input as a logic 1 input. The ground applied to DB relay K7 that causes it to energize is applied across the A2R7/A2R8 voltage divider to inverter A3A2(HK). A3A2(HK) inverts the ground input (a logic 0) and applies a logic 1 to the A3A2-L gate input. Two logic 1 inputs at A3A2-M and L set the gate output at A3A2-N to a logic 0. A logic 0 at A3A2-N causes K7 indicator DS6) to light.

(b) The logic 0, or ground, at A3A2-N causes transistor A3Q8 to turn off (the A3A2-N gate output was previously at a logic 1 and A3Q8 was turned on). When A3Q8 turns off, transistor A3Q9 turns on, applying a ground to the K7 indicator. The ground causes the K7 indicator to light, indicating that relay K7 in the DB under test is energized.

(c) The A3Q8/A3Q9 transistor network also controls the K7 relay switching indication signal applied to the INPUT A and INPUT B coaxial test connectors through RELAY TIME SELECTORS rotary switches (S17-A and S18-A). The signal is normally +24 Vdc and goes to 0 Vdc when DB relay K7 is energized.

(d) When DB relay K7 deenergizes, the logic 1 inputs to the A3A2(LMN) gate change state. A logic 0 input at A3A2-L or M causes the gate output at A3A2-N to set to logic 1. A logic 1 at A3A2-N causes the K7 indicator to go out. A3Q8 is turned on, A3Q9 is turned off, and the ground applied to the K7 indicator is removed.

(e) The A2R17/A2R18 and A2R7/A2R8 resistor voltage dividers are used to drop the +24 Vdc signals from the DB under test to +5 Vdc (a logic 1) to operate the logic circuits.

(2) LO Rate. When RATE switch (S8) is set to LO and TRIGGER switch (S9-C2) is set to ON, +24 Vdc is applied through DB relay K11 contacts and the RATE switch (S8-E) to one side of DB relay K7. A +24 Vdc signal from the DB under test is applied through resistor A1R9 and the RATE switch (S8-B) to the K7 time delay circuit in DB after a slight delay. The DB time delay circuit energizes DB relay K7. Resistor A1R9 causes the DB relay K7 energizing time delay to be slightly longer than when the relay is being checked in the HI rate mode. DB relay K7 will remain energized until the +24 Vdc being applied to it is removed.

(a) Operation of the test circuits that check proper energization of DB relay K7 in the LO rate mode of operation is the same as when the relay is checked in the HI rate mode.

(b) The +24 Vdc signal applied to DB relay K5 through the RATE switch (S8-C) when it is set to LO, simulates the system signal applied to the relay when system is being operated in the LO rate of fire mode.

i. K11 (Clearing) Test Circuits.

(1) General. The primary test circuits are logic circuits contained on the DB test panel K11 operation and sequence circuit card assembly (A6). The logic circuits control the operation of K11 indicator (DS10). Proper operation of the K11 relay in the DB under test is checked by setting up test conditions to light the K11 indicator. Under all test conditions, once the K11 indicator is lit, it goes out by pressing the DB test panel RESET pushbutton switch.

(a) AUTO Clear. When DB test panel CLEAR MODE switch (S4) is set to AUTO, the K11 indicator will light if DB relay K11 deenergizes after remaining on at least 1000 ms (1 second) after TRIGGER switch (S9) is set to OFF, or after the BURST LIMIT switch (S10) is set to ON.

(b) MAN Clear. When DB test panel CLEAR MODE switch (S4) is set to MAN, and then to OFF, the K11 indicator will light if DB relay K11 deenergizes after remaining on at least 1 second after the switch is set to OFF.

(2) DB Relay K11 Operation. DB relay K11 is energized through the K11 deactivating time delay circuit in the DB under test. A +24 Vdc signal from the DB through CLEAR MODE switch (S4-C) operates the time delay circuit. If the CLEAR MODE switch is set to AUTO, the DB trigger relay K5 (and DB relay K3) must be energized to apply the signal. When DB relay K5 is deenergized, +24 Vdc is applied to DB relay K11, causing it to energize. The time delay circuit applies a ground to the opposite side of DB relay K11, keeping the relay energized until the circuit time delay is completed. Once the time delay is completed DB relay K11 deenergizes.

NOTE

All circuit components in the following description of the K11 test circuits are on the DB test panel K11 operation and sequence circuit card assembly A6, unless otherwise noted.

(3) K11 Indicator Operation - AUTO Clear. If either the TRIGGER switch is set to OFF or the BURST LIMIT switch is set to ON when the CLEAR MODE switch is set to AUTO, DB relay K11 is energized (by DB relay K5 deenergizing). When DB relay K11 is energized, a + 24 Vdc signal from the DB under test is applied across the A2R3/A2R4 resistor voltage divider, as the K11 input signal, to the K11 operation and sequence A6 circuit card assembly logic circuits. The A2R3/A2R4 voltage divider reduces the +24 Vdc to +5 Vdc (a logic 1). A logic 1 K11 signal indicates DB relay K11 is energized.

(a) Both inputs to the A3(HIK) gate are normally at +5 Vdc (a logic 1). If DB relay K11 is energized by setting the TRIGGER switch to OFF, the TR signal input to the A3(HIK) gate goes to 0 Vdc (a logic 0). If DB relay K11 is energized by setting the BURST LIMIT switch to ON, the BL signal to the A3 (HIK) gate goes to a logic 0. A logic 0 input at either of the gate inputs causes the gate output A3-K to set to a logic 1. A logic 1 at A3-K indicates that either the TRIGGER switch is set to OFF, or the BURST LIMIT switch is set to ON.

(b) The logic 1 at A3-K is applied to the A3-L gate input. When CLEAR

MODE switch (S4-A) is set to AUTO, the A3-M gate input is also a logic 1, through inverter A3(EG). Two logic 1 inputs at A3-L and M cause the gate output A3-N to set to a logic 0.

(c) The logic 0 is applied to the A2-A gate input, causing the gate output A2-C to set to a logic 1 (regardless of what the A2-B gate input is). Inverter A2(LN) inverts the logic 1 at A2-C and applies a logic 0 to transistor Q1.

(d) The logic 0 applied to Q1 causes it to turn off (the inverter output at A2-N was previously a logic 1 and Q1 was turned on). When Q1 turns off, capacitor C3 begins being charged through resistors R5 and R7. R7 is selected to obtain a time delay of 1000 ms from the time Q1 is turned off (the TRIGGER switch is set to OFF, or the BURST LIMIT switch is set to ON) to the time the voltage charge on C3 triggers the unijunction transistor Q2. When Q2 is triggered, transistor Q3 is momentarily turned on, applying a 0 Vdc, logic 0, input signal at A4-C to the TIME DELAY COMPLETE latch circuit A4(ACE) and A4(FGHI). If the latch A4-G input is still at a logic 1 (the TRIGGER switch is still set to OFF, or the BURST LIMIT switch is still set to ON), the latch output at A4-I latches to a logic 0. The logic 0 latched at A4-I indicates that the time delay has been completed.

(e) Inverter A4(LN) inverts the logic 0 latched at A4-I and applies a logic 1 to the A5-L gate input. The K11 signal being applied to the logic circuits is applied to the A5-M gate input.

(f) The A5(LMN) gate assures DB relay K11 has remained energized for at least as long as the time delay in the test circuitry. When DB relay K11 is deenergized, the K11 signal at A5-M goes to a logic 0. If DB relay K11 deenergizes before the TIME DELAY COMPLETE latch has caused a logic 1 to be applied to A5-L through inverter A4(LN), the gate output at A5-N is set to a logic 1. A logic 1 at A5-N will not cause the K11 ON AFTER TIME DELAY latch circuit, A5(ABC) and A5(HIK), to change its output state. The latch circuit output at A5-C will remain set at a logic 0.

(g) If DB relay K11 is not deenergized (K11 signal a logic 1) after the TIME DELAY COMPLETE latch has caused a logic 1 to be applied to A5-L, logic 1 signals at A5-L and M cause the gate output to go to a logic 0. A logic 0 at A5-N causes the K11 ON AFTER TIME DELAY latch output at A5-C to latch to a logic 1. The logic 1 latched at A5-C indicates that DB relay K11 remained energized at least as long as the test circuit time delay.

(h) The A5(FEG) gate assures DB relay K11 has deenergized before the K11 indicator is caused to light. The logic 1 latched at A5-C is applied to the A5-F gate input. If DB relay K11 does not deenergize (K11 signal a logic 1) the signal at the A5-E gate input is a logic 0 through inverter A3(AC). The logic 0 at A5-E sets the gate output at A5-G to a logic 1. A logic 1 at A5-G will not cause the K11 indicator to light.

(i) If DB relay K11 deenergizes (the K11 signal is a logic 0), the signal at the A5-E gate input goes to a logic 1. The two logic 1 inputs at A5-F and E set the gate output A5-G to a logic 0. A logic 0 at A5-G will cause the K11 indicator to light.

(j) The logic 0 output, 0 Vdc, at A5-G causes transistor Q4 to turn off (the gate output was previously at a logic 1 and Q4 was turned on). When Q4 turns off, transistor Q5 turns on applying a ground to the K11 indicator (DS10). The ground causes the K11 indicator to light, indicating that DB relay K11 has operated properly.

(4) K11 Operation - Manual Clear. Setting the CLEAR MODE switch to MAN and then to OFF energizes relay K11 in the DB under test. After setting the

switch to OFF, the DB K11 relay will remain energized until its time delay is completed. The K11 input signal applied to the logic test circuits is the same as described previously.

(a) When the CLEAR MODE switch is set to MAN, the MAN input signal to the A1(HIK) gate-H input is a logic 0. The logic 0 at A1-H sets the gate output A1-K to a logic 1. Inverter A1(EG) inverts the logic 1 at A1-K and applies a logic 0 to the A1-B input of the MANUAL MODE OR LAST ROUND ON latch circuit, A1(ABC) and A1(LMN). The logic 0 at A1-B causes the MANUAL MODE OR LAST ROUND ON latch output, at A1-C, to latch to a logic 1. The logic 1 latched at A1-C indicates that the CLEAR MODE switch was set to MAN.

(b) The A2(EFG) gate makes sure that the CLEAR MODE switch is set to OFF before the test circuit time delay is activated. The logic 1 latched at A1-C is applied to the A2-E gate input. When the CLEAR MODE switch is set to OFF, the A2-F gate input is also set to a logic 1 through gate A1(HIK) and inverter A1(EG). The A1-H and I gate inputs are at a logic 1 and the gate output (a logic 0) is inverted by A1(EG) and applied to A2-F.

(c) The two logic 1 inputs at A2-E and F set the gate output A2-G to a logic 0. The logic 0 at A2-G is applied to the A2-B gate input. The logic 0 at A2-B causes gate output A2-C to set to a logic 1 (regardless of what the A2-A gate input is). Inverter A2(LN) inverts the logic 1 at A2-C and applies a logic 0 to Q1, starting the test circuit time delay.

(d) The operation of the remainder of the K11 test circuitry is the same as described previously in the AUTO clear test mode. If DB relay K11 deenergizes after remaining on at least 1000 ms after the CLEAR MODE switch is set from MAN to OFF, the K11 indicator lights.

(5) K11 Operation - Last Round. Because the last round relay and switch has by-passed K11, operational input signal to the logic test circuits is the same as described previously.

(6) Noise Suppression. Resistor R1 and capacitor C1 filter the +18 Vdc used by the K11 operation and sequence A6 circuit card assembly circuits. Resistor R2 and capacitor C2 filter the +5 Vdc used by the circuit card assembly circuits. Capacitors A8C10, A8C11, and A8C12 are noise suppression capacitors on the logic circuit latch circuits.

(7) Relay Time Selectors Operation. The A7Q5 transistor network controls the relay K11 switching indication signal applied to INPUT A and INPUT B coaxial test connectors, J18 and J19, through RELAY TIME SELECTORS rotary switches (S17-A and S18-A). Setting the switches to the appropriate positions allows the K11 relay switching indication signal to be monitored at either of the test connectors. The signal is normally +24 Vdc and goes to 0 Vdc when DB relay K11 is energized. A7Q5 is turned on by the same +24 Vdc signal from the DB under test that is applied across the A2R3/A2R4 voltage divider to the logic circuits as the K11 input signal. When A7Q5 is turned on, the K11 relay switching indication signal to the INPUT A and INPUT B test connectors is set to ground (0 Vdc).

(8) CLEAR MODE Switch (S4-B). The +24 Vdc from the DB under test that is applied to the DB through CLEAR MODE switch (S4-B), also simulates system signal inputs applied to the DB when a M163A1 or M167A1 system is being operated in AUTO or MAN clear mode.

j. K13 (Elevation Limit), K15 (Right Limit), and K16 (Left Limit) Test Circuits

(1) K13 Test Circuit. The DB test panel K13 test circuit consists of EL LIMIT switch (S12), the transistor

A7Q8 network, and K13 indicator (DS20). Setting the EL LIMIT switch to ON applies +24 Vdc to DB relay K13, causing it to energize. Energizing DB relay K13 applies +24 Vdc from the DB under test to the A7Q8 network. The +24 Vdc applied to A7Q8 causes it to turn on and apply a ground to K13 indicator (DS20). The ground causes the K13 indicator to light, indicating proper operation of DB relay K13.

(2) K15 Test Circuit. The DB test panel K15 test circuit consists of RIGHT LIMIT switch (S13), the transistor A7Q6 network, and K15 indicator (DS22). The test circuit operates in the same manner as the K13 test circuit. When the K15 indicator lights, proper operation of relay K15 in the DB under test is indicated.

(3) K16 Test Circuit. The DB test panel K16 test circuit consists of LEFT LIMIT switch (S14), the transistor A7Q7 network, and K16 indicator (DS21). The test circuit also operates in the same manner as the K13 test circuit. When the K16 indicator lights, proper operation of relay K16 in the DB under test is indicated.

k. K14 (Acquisition Time Delay) Test Circuit. The test circuit consists of ACQ TIME switch (S11), the transistor A7Q9, diode A7 CR4, and K14 indicator (DS18). Setting the ACQ TIME switch to ON applies 24 Vdc to DB relay K14, causing it to energize. Energizing DB relay K14 applies a voltage signal from the DB under test to transistor A7Q9. The voltage signal applied to A7Q9 causes it to turn on and apply a ground to K14 indicator (DS18). The ground causes the K14 indicator to light, indicating proper operation of DB relay K14.

l. K1 (Loading) Test Circuit. The test circuit consists of LOAD switch (S2) and K1 indicator (DS17). Setting the LOAD switch to ON applies +24 Vdc from the DB under test through the switch to DB relay K1. The +24 Vdc causes DB relay K1 to energize. When DB relay K1 energizes, +24 Vdc from the DB under test is applied to the K1 indicator. The +24 Vdc causes the K1 indicator to light, indicating proper operation of DB relay K1.

m. K17 (Radar Power) Test Circuit. The test circuit consists of RADAR ELECTRONICS switch (S7) and K17 indicator (DS19). Setting the RADAR ELECTRONICS switch to ON applies +24 Vdc from the DB under test (if DB relay K2 is energized) through the switch to DB relay K17. The +24 Vdc causes DB relay K17 to energize. When DB relay K17 energizes, +24 Vdc from the DB under test is applied to the K17 indicator. The +24 Vdc causes the K17 indicator to light, indicating proper operation of DB relay K17.

n. Continuity Test Circuits. There are two test circuits. One test circuit allows certain wiring in the DB under test to be checked by energizing DB relay K4 and measuring the +24 Vdc signal applied to DB test panel TEST POINT 5. The +24 Vdc signal is routed back and forth between the DB test panel and DB under test before being applied to the test point. The other test circuit operates in the same manner; when DB relay K17 is energized, a +24 Vdc signal is applied to DB test panel TEST POINT 4.

3-7. Control Panel 2A2A1.

a. Functional Flow Analysis. The control panel is used to check out and fault isolate the systems control panel assembly (CP). The CP under test is mated to the control panel with test cables (fig. 1-4). Switches and test circuitry in the control panel are used to simulate systems inputs, and provide test signals to the CP. Indicators and test points on the control panel are provided to monitor the operation of the CP being tested.

(1) The +24 Vdc power distribution to the CP under test and to the test panel is controlled through the control panel +24 Vdc power switching. The +15 Vdc power distribution to the CP under test is controlled through the control panel +15 Vdc ADJUST circuit.

(2) The control panel potentiometer select switching provides a means to measure the resistance of selected potentiometers in the CP under test. Both sides (and the wiper) of a selected potentiometer are connected through the switching to test points. The control panel also controls application of simulated rounds counter inputs to the CP under test (M163A1 only). The simulated inputs are generated by the control panel rounds counter test circuit.

(3) Switching is provided on the control panel to provide a means of making function checks of selected switches in the CP under test. A switch function check indicator indicates whether the switches are operating properly.

(4) The control panel continuity check switching provides a means to check out wiring continuity within the CP under test.

(5) The continuity check and switch function check switching circuits also provide a means to check signals at the CP test connector, and selected control panel input and output signals. The switches also provide a means to make resistance measurements during the CP checkout procedures. Setting the switches to appropriate positions connects the signal being checked to a test point on the control panel. Refer to figure FO-8 for the appropriate switch settings that allow each signal to be monitored.

(6) Detailed analysis of the control panel in this section is separated into detailed descriptions of the functions described above. Figure FO-8 is the control panel detailed schematic diagram.

NOTE

Unless otherwise stated, components referenced in the following descriptions are in the AN/TSM-100 control panel (2A2A1). Detailed functional analysis of the system control panel (CP) is contained in the appropriate system technical manual (appendix A).

b. +24 Vdc Power Distribution. The CP test panel receives +24 Vdc operating power from the AN/TSM-100 power panel (2A1A3) when the power panel DISTRIBUTION switch is set to CONT PNL. The +24 VDC POWER ON/OFF switch (S3) controls application of the +24 Vdc power to the CP test panel circuits and the CP under test. When the +24 VDC POWER ON/OFF switch (S3) is set to ON, +24 Vdc is being applied directly to the CP under test. The +24 Vdc indicator (DS3) lights when the +24 Vdc is being applied. The 0.5 AMP fuse (F1) provides circuit overload protection.

(1) When +24 Vdc operating power is distributed to the CP under test, it is applied to the CP system power, gun power, and action switches. Setting these CP switches to ON distributes the +24 Vdc through the CP. At the same time, the +24 Vdc is also applied to the CP RADAR-READY WHEN LIT, and TEST-GOOD WHEN LIT indicators to allow their operation to be checked.

(2) When the CP under test is connected to the CP test panel, a ground is applied to one side of each CP tachometer. The tachometer outputs are connected through CONTINUITY CHECK switch (S2-D) and SWITCH FUNCTION CHECK switch (S1-B) to test point TP5.

When the switches are set to the appropriate positions during system CP checkout procedures, the operation of each tachometer can be monitored at TP5.

c. +15 Vdc Power Distribution. The +15 Vdc regulated power supply receives +24 Vdc from the CP test power circuit, when the +24 VDC POWER ON/OFF switch (S3) is set to ON. The +15 volt regulated power may be monitored at TP1 (+) and TP2 (-) when POTENTIOMETER SELECT rotary switch (S4) is set to position 1.

d. Potentiometer Select Switching Circuits. The switching circuits are used to make CP potentiometer resistance measurements and to apply simulated rounds counter input signals to the CP under test.

(1) Setting POTENTIOMETER SELECT rotary switch (S4) to any position from 1 through 6 connects both sides of a CP potentiometer to test points TP1 and TP2. At the same time the wiper of the potentiometer is connected to WIPER test point (TP3). This allows resistance measurements to be made across a CP potentiometer, or from the wiper to either side of the potentiometer using the test points.

(2) POTENTIOMETER SELECT switch positions 7 and 8 control application of the simulated rounds counter signals to the CP under test. When the switch is set to 7, capacitor C1 is charged through resistor R1. Setting the switch to 8, causes C1 to discharge through the rounds counter (A1M1) in the CP under test (M163A1 only). By alternately switching the POTENTIOMETER SELECT switch between 7 and 8, charging and discharging C1, a series of voltage pulses is applied to the CP rounds counter. The voltage pulses simulate system CP rounds counter input signal (M163A1 only). Operation of the CP rounds counter is checked by observing that the counter counts the pulses. Resistor R2 makes sure C1 is discharged after the CP rounds counter checkout has been performed. Rotating the POTENTIOMETER SELECT switch through position 6 discharges C1 through R2.

e. Switch Function Check Switching Circuits. The switching circuits are used to check operation of selected switches on the CP under test. The CP switches checked are connected through SWITCH FUNCTION CHECK rotary switch (S1-A) to SWITCH FUNCTION CHECK indicator (DS1). When the CP switch being tested is set to the appropriate position, +24 Vdc is applied through the CP switch and the SWITCH FUNCTION CHECK switch to the SWITCH FUNCTION CHECK indicator (DS1). The +24 Vdc applied to the SWITCH FUNCTION CHECK indicator causes the indicator to light, indicating proper operation of the CP switch.

(1) SWITCH FUNCTION CHECK switch (S1-A) positions A through F are used to check operation of the CP mode switch. In switch positions A through D and F, +24 Vdc from the CP system power switch (routed through the CP test panel) is applied to the CP mode switch decks being tested. Setting the CP mode switch and SWITCH FUNCTION CHECK switch (S1-A) to the appropriate positions applies +24 Vdc to the SWITCH FUNCTION CHECK indicator (DS1), causing it to light. In this manner each position of the CP mode switch decks being tested can be checked out. In SWITCH FUNCTION CHECK position E +24 Vdc from the CP test panel is applied through a single CP mode switch position and the CP slew limit switches to the SWITCH FUNCTION CHECK indicator (DS1), causing it to light.

(2) SWITCH FUNCTION CHECK switch position G is used to check operation of the CP burst limit switch. The +24 Vdc from the CP test panel is applied to the switch. Setting the CP burst limit switch to the appropriate positions and SWITCH FUNCTION CHECK switch (S1-A) to G applies +24 Vdc to the SWITCH FUNCTION CHECK indicator (DS1),

causing it to light. In this manner each position of the CP burst limit switch can be checked out.

(3) SWITCH FUNCTION CHECK switch (S1-A) position H is used to check operation of the CP gun power, gun clear, and trigger switches. The +24 Vdc from the CP gun power and gun clear switches, is routed through the CP test panel to the CP trigger switch. Setting the CP trigger and gun power switches to ON and SWITCH FUNCTION CHECK switch (S1-A) to H applies the +24 Vdc to the SWITCH FUNCTION CHECK indicator (DS1) (when gun clear switch is in AUTO and OPERATOR positions). The +24 Vdc causes the SWITCH FUNCTION CHECK indicator (DS1) to light, indicating proper operation of the CP switches being tested.

(4) SWITCH FUNCTION CHECK switch (S1-A) position I is used to check operation of the CP action switches and sight cage switch. The +24 Vdc through the action switches, routed through the CP test panel, is applied to the CP sight cage switch. Setting the sight cage switch to ON and SWITCH FUNCTION CHECK switch (S1-A) to I, applies the +24 Vdc to the SWITCH FUNCTION CHECK indicator (DS1). The +24 Vdc causes the SWITCH FUNCTION CHECK indicator (DS1) to light, indicating proper operation of the CP switches being tested.

(5) Most of the input and output signals at the CP test panel are connected through the CP test panel CONTINUITY CHECK switch (S2-A) and the SWITCH FUNCTION CHECK switch (S1-A) to CP test panel test point TB5. Refer to figure FO-8 for the appropriate switch settings that allow each signal to be monitored at the test point.

f. Continuity Check Switching Circuits. The switching circuits are used to check continuity of wiring runs in the CP under test. The wiring runs checked are connected through CONTINUITY CHECK rotary switch (S2-A) to CONTINUITY CHECK indicator (DS2). A +24 Vdc signal from the CP test panel is routed back and forth between the CP under test and CP test panel. At various points as the signal is routed through the CP test panel, the signal is connected to switch positions of the CONTINUITY CHECK switch (S2-A).

(1) Setting the CONTINUITY CHECK switch (S2-A) to position 1 allows all the CP wiring runs being tested to be checked. If none of the wiring runs are open, the +24 Vdc signal is applied through the switch to the CONTINUITY CHECK indicator (DS2), causing it to light. If any of the CP wiring runs are open, the CONTINUITY CHECK indicator (DS2) will not light. If the indicator does not light with the switch in position 1, rotating the CONTINUITY CHECK switch (S2-A) through its different positions until the CONTINUITY CHECK indicator (DS2) lights, allows the particular CP wiring run that is open to be isolated.

(2) All of the wiring run signals routed through the CP test panel are also connected through other decks of the CP panel CONTINUITY CHECK switch (S2-A) and the SWITCH FUNCTION CHECK switch (S1) to test point TP5. Refer to figure FO-8 for the appropriate switch settings that allow each signal to be monitored at the test point.

3-8. Servo Amplifier 2A2A2, and Inverter/Converter Test Panel 2A2A4.

a. Functional Flow Analysis. Both assemblies are located in the AN/TSM-100 right-hand rack. The servo amplifier panel and inverter/converter test panel are used to check out and fault isolate the system servo amplifier assembly (SA). The servo amplifier panel (2A2A2) (SA test panel) contains switches and potentiometers to simulate systems inputs. The motor load assembly (2A2A4A1) is used to provide simulated system motor loads for the SA under test. Indicators, test points, and coaxial test connectors are provided on the SA test panel to monitor the operation of the SA being tested. During SA fault isolation procedures, W102 cable can be connected to the A1 components assembly (J1) in the SA under test to provide access to test points on the component assembly (fig. 1-4). The motor load assembly (2A2A4A1) also contains relay K1 and resistors R1 through R15 used as loads when testing the system inverter.

(1) The +24 Vdc power distribution to the SA under test, the SA test panel, and the inverter/converter test panel is controlled through the SA test panel +24 VDC POWER switch.

(2) The SA test panel hand control and dead band potentiometers provide a means to apply simulated system hand control input signals to the SA under test. The signals are applied through the SA test panel test select switching circuits. A tachometer feedback signal from the inverter/converter test panel also forms part of the simulated hand control input signal. The tachometer feedback signal simulates the system tachometer feedback signal that is part of a system hand control input signal.

(3) The output signals from the SA under test are routed through the SA test panel and applied to motor B1 in the motor load assembly (2A2A4A1). The inverter/converter contains two motors, B1 and B2, connected through gearing to form a motor-generator. Motor B1 acts as a drive motor, driving motor B2, which is connected in the assembly to act as a generator. The drive motor also drives the assembly tachometer. The mechanical load on the drive motor is varied by varying the electrical load on the generator it drives. The electrical load on the generator is varied by relay switching in the generator load circuits. The generator load switching is controlled through the SA test panel load select switching.

(4) The SA test panel DIGITAL VM SELECT and SCOPE SELECT switches provide a means to check SA input and output signals. When W102 cable is being used, the switching also allows signals at test points on the A1 component board in the SA under test to be monitored. Setting the switches to the appropriate positions connects the signal being checked to either SA test panel coaxial test connector J25 or J26. The coaxial test connectors are provided to allow the signals checked through the switching to be connected with test cables, to either an oscilloscope or multimeter.

(5) Detailed analysis of the SA test panel and inverter/converter test panel in this section is separated into detailed descriptions of the functions described previously. Figures FO-9 and FO-11 are the SA test panel and inverter/converter test panel detailed schematic diagrams.

NOTE

Components reference in the following descriptions are in the AN/TSM-100 servo amplifier panel (2A2A2) and inverter/converter test panel (2A2A4) unless otherwise stated. Detailed functional analysis of systems servo amplifier assembly is contained in the appropriate system technical manual (appendix A).

b. +24 Vdc Power Distribution. The SA test panel receives +24 Vdc operating power from the AN/TSM-100 power panel (2A1A3) when the power panel DISTRIBUTION switch (S1) is set to SVO AMPL (fig. FO-3). The +24 VDC ON/OFF switch (S9) controls application of the +24 Vdc power. When the +24 VDC ON/OFF switch (S9) is set to ON, +24 Vdc is applied to relay K2 causing it to energize. When relay K2 is energized, its contacts close, allowing +24 Vdc operating power to be applied to the SA under test. SERVO LOAD circuit breaker CB1 (35A) provides overload protection, and SERVO LOAD shunt resistor R4 provides a means to measure the current being drawn by the SA under test. The current is measured by measuring the voltage between the SERVO LOAD + and - test points (TP5 and TP6). Each millivolt measured between the test points is equivalent to one ampere of current being drawn by the SA under test.

(1) When +24 Vdc power is distributed to the SA under test, it is also distributed through POWER circuit breaker CB2 (7.5A) to the SA test panel circuits and the inverter/converter test panel (2A2A4). CB2 provides circuit overload protection for the SA test circuits and inverter/converter panel (2A2A4).

(2) The +24 VDC indicator (DS2) lights when the +24 VDC ON/OFF switch (S9) is set to ON, indicating +24 Vdc is being applied. Diode A1CR5 provides arc suppression for the K2 relay coil.

c. Hand Control Potentiometer and Test Select Switching Circuits. The circuits provide simulated system hand control signal inputs to the SA under test. TEST SELECT switch (S1) controls the type of simulated hand control signal applied to the SA.

(1) When the TEST SELECT switch (S1) is set to RADAR MODE, HAND CONTROL potentiometer (R1) is connected across the input differential amplifier in the SA under test. If the HAND CONTROL potentiometer (R1) is set to 0, both input sides of the differential amplifier in the SA under test are balanced to ground through the potentiometer wiper. When the inputs to the SA differential amplifier are balanced to ground, the cw and ccw input signals to the SA are equal and no output signals are developed by the SA. Rotating the HAND CONTROL potentiometer (R1) from its center position causes an unbalance in the resistance and voltage between the SA differential amplifier inputs. An unbalanced input causes the SA under test to generate an output signal that drives the motor load assembly drive motor in the direction set by the unbalanced input. If the HAND CONTROL potentiometer (R1) is positioned to cause an increase in the resistance between the SA differential amplifier cw input and ground (through the potentiometer wiper), the voltage at the differential amplifier cw input increases, and the voltage at the differential amplifier ccw input decreases proportionally. An increase in the cw input signal to the SA under test causes the SA to generate a cw output signal that is applied through SA test panel to the motor load assembly drive motor. The cw output signal is applied to the drive motor cw field winding, causing the motor to rotate in the cw direction. The greater the unbalance set at the SA differential amplifier cw input, the greater the cw output signal the SA under test will generate. The greater the cw output signal from the SA under test, the faster the motor load assembly drive motor will be driven in the cw direction. The simulated system cw input signal to the SA under test is obtained by setting the HAND CONTROL potentiometer (R1) to any position between 0 and 180° in the +90° direction.

(2) Setting the HAND CONTROL potentiometer (R1) to any position between 0 and 180° in the -90° direction causes a simulated ccw input signal to be applied to the SA under test. The operation of the potentiometer is the same as when the potentiometer is set to simulate a cw input signal. In this case, the voltage at the SA differential amplifier ccw input is increased, causing the SA to generate a ccw output signal. The brakes on the load motors must be set in the off position. The ccw output signal is applied to the motor load assembly drive motor ccw field winding, causing the motor to be driven in a ccw direction. The speed at which the motor is driven depends on the setting on the HAND CONTROL potentiometer (R1). The

speed will increase as the control setting is adjusted from 0 to 180°.

(3) When the motor load assembly drive motor is being driven, the tachometer connected to the motor generates feedback signals that are added to the HAND CONTROL potentiometer (R1) signals being applied to the SA under test. The tachometer signals are opposite in polarity to the voltages developed across the HAND CONTROL potentiometer (R1). The polarities will be reversed if the motor is being driven in a ccw direction. The tachometer feedback signals make sure that the motor load assembly drive motor drives at a constant speed (the speed set by the HAND CONTROL potentiometer R1). If the drive motor speed decreases, the tachometer feedback signal decreases, causing the HAND CONTROL potentiometer (R1) input signal to appear greater. The greater HAND CONTROL potentiometer (R1) input signal will cause the SA under test to drive the drive motor harder to attain the proper speed. If the drive motor speed begins to increase from the rate at which it is set, the tachometer feedback signal increases. Increasing the tachometer feedback signal causes the HAND CONTROL potentiometer (R1) input signal to decrease. The decreased HAND CONTROL potentiometer (R1) input signal will cause the drive motor to be driven slower. In this manner, the tachometer feedback signals constantly adjust the HAND CONTROL potentiometer (R1) input signals to assure that the motor load assembly drive motor is driven at a constant speed controlled by the setting of the HAND CONTROL potentiometer (R1). The resistor and diode network in the SA test panel, through which the tachometer feedback signals are applied, simulates the feedback network in the systems. The TACH + and - test points (TP7 and TP8) are provided to allow the tachometer feedback signals to be monitored during system SA checkout and fault isolation procedures.

(4) When the TEST SELECT switch (S1) is set to DEAD BAND, DEAD BAND potentiometer (R2) is connected between A1R10 and A1R11 across the input differential amplifier in the SA under test. The DEAD BAND potentiometer (R2) provides finer control than the HAND CONTROL potentiometer (R1).

d. Inverter/Converter Test Panel (2A2A4). The inverter/converter test panel (2A2A4) provides a means to simulate system loads on the SA under test. The motor load assembly (2A2A4A1) contains two motors, connected through gearing to form a motor generator. Motor B1 is the drive motor and motor B2 is the generator. The load on the drive motor is varied by varying the electrical load on the generator it drives.

(1) The motor load assembly drive motor is driven by the cw and ccw output signals from the SA under test. The SA output signals are applied through contacts of relay K1 in the SA test panel. SA test panel relay K1 is energized when LOAD SELECT switch (S2) is set to 1/3, 2/3, or FULL. LOAD ON indicator (DS1) lights when relay K1 is energized indicating that the SA output signals are being applied to the drive motor. Diode A1CR6 provides arc suppression for the K1 relay coil.

(2) The SA under test either generates a cw or a ccw output signal, depending on the SA test panel HAND CONTROL potentiometer (R1) input. The output signal is applied to the appropriate field winding of the drive motor driving the motor in either the cw or ccw direction. The speed at which the motor is driven depends on the setting of the SA test panel HAND CONTROL potentiometer (R1).

(3) The drive motor drives the motor load assembly generator and tachometer. Operation of the tachometer was described previously. The generator provides the primary mechanical load on the drive

motor. The drive motor force necessary to drive the generator is dependent on the electrical load on the generator. The load applied on the generator is controlled by the SA test panel LOAD SELECT switch (S2).

(4) When the SA test panel LOAD SELECT switch (S2) is set to 1/3, no load is applied to the motor load assembly generator. The load which the drive motor drives is simply the generator motor.

(5) When the LOAD SELECT switch (S2) is set to 2/3, relay K1 in the motor load assembly is energized. Energizing motor load assembly K1 causes its contacts to close and load resistors R1 and R3 to be connected across the generator. The load resistors connected across the generator force the drive motor to drive the generator harder. If the generator is being driven in a cw direction, the load current flow is through R3 and diode CR1. If the generator is being driven in a ccw direction, the load current flow is through R1 and diode CR2. Diode CR3 provides arc suppression for the K1 relay coil.

(6) When the LOAD SELECT switch (S2) is set to FULL, both relays K1 and K2 in the motor load assembly are energized. Energizing both relays connects load resistors R1 through R4 across the generator. The additional load resistors increase the load on the generator and force the drive motor to drive the generator even harder. If the generator is being driven in a cw direction, the load current flow is through resistors R3 and R4, and diode CR1. If the generator is being driven in a ccw direction, the load current flow is through resistors R1 and R2, the diode CR2. Diode CR4 provides arc suppression for the K2 relay coil.

(7) The Q1/ Q2 transistor network in the generator load circuits is provided to set up an initial current flow in the generator field windings. The initial current flow is necessary so that, when the drive motor begins driving the generator, the generator has enough field current to begin generating power. Once the generator begins generating power, it supplies its own field current. Variable resistor R8 provides a means to adjust the initial current flow set up in the field windings.

(8) The cw and ccw output signals from the SA under test are also connected through DIGITAL VM SELECT rotary switch (S5) and SCOPE SELECT rotary switch (S6) to coaxial test connectors J25 and J26. By setting either switch to the appropriate position, either output signal can be monitored at its selected test connector.

3-9. SCG Servo Test Panel 2A2A6.

a. Functional Analysis. The SCG servo test panel (2A2A6) is used in conjunction with the sight current generator panel 2A1A1 to check out and fault isolate the power series assembly of the system sight current generator. The SCG servo panel checks the power series assembly of the sight current generators. The SCG servo test panel contains three circuit card assemblies that generate simulated range and range rate data, a motor, an electrical brake, and a fan that are used as loads when testing the system inverter. The SCG servo test panel also contains two RF amplifier assemblies used when noise tests are performed on unit 2. The power series assembly under test is mounted on the power series test adapter and then mated to the test panel with a cable. Switches and circuit card assemblies are used to simulate system inputs and loads. Indicators and test points on the test panel assembly are provided to monitor the operation of the power series assembly being tested. Inverters under test are mated to the inverter/ converter test panel 2A2A4. A synchro motor on the chassis assembly is used to test and align a synchro transmitter in the AN/TPM-23 organizational maintenance test set (OMTS). The OMTS under test is mated to the test panel with a cable. Test points on the test panel are used to monitor operation of the OMTS.

(1) Distribution of the AN/TSM-100 inverter output power to the test panel is controlled through relay K1. Relay K1 is energized when the test panel POWER switch S25 is set to ON.

(2) Simulated system range and range rate signals are applied to the power series assembly under test by means of the three range and range rate circuit cards of the test panel.

(3) The range and range rate signals are controlled by switches S28, S29, S30, and S31. Switches S28 RANGE START and S29 RANGE RATE START, when pressed separately, will apply either range or range rate data to the unit under test. Pressing switch S30 RANGE AND RANGE RATE applies range and range rate data to the unit under test at the same time. Switch S31 controls the simulated direction of the target, inbound to outbound when the DIRECTION switch is in the IN position and outbound to inbound in the OUT position.

(4) The range and range rate switches under each indicator cause an analog voltage to be applied to the power series unit under test, equivalent to the range or range rate switch or switches set to ON.

(5) Manual/automatic switch S1 RANGE RATE and S2 RANGE applies range or range rate or both range and range rate data to the unit under test in the AUTO position. When in the MAN position, range and range rate data is applied to the unit under test by the sight current generator panel 2A1A1.

(6) Distribution of the test panel voltages to the power series assembly is controlled by S24 UUT PS1 and S27 UUT PS2. Switch S24 controls the ±15 Vdc, +24 Vdc, 26 Vac and the range signal data. Switch S27 controls the +15 Vdc, +20 Vdc reference, ±310 Vdc range rate reference and the regulated +12 Vdc.

(7) Switch S4 SYNCHRO controls the 115 Vac to SYN 1 synchro motor. The stator output voltages are applied to the AN/TPM-23 under test.

(8) Four rotary switches above test points TP9, TP10, TP11, and TP12 monitor the input and output voltages during testing of the unit under test.

(9) Switch S33 AMPL supplies +15 Vdc to two RF amplifiers AR1 and AR2 when set to the ON position.

3-10. Inverter/Converter Test Panel 2A2A4.

a. The inverter/converter test panel is used to test and troubleshoot the system inverter, power inverter 2A2PS1, and the ±15 Vdc power supply (converter) A21PS1. The unit under test is mated to the test panel with a cable. Switches and test circuitry are used to apply simulated system input and loads. Indicators and test points on the test panel assembly are provided to monitor the operation of the unit being tested.

(1) Distribution of the AN/TSM-100 inverter output power to the unit under test is controlled by switches S1 through S9 (refer to fig. FO-11).

(2) Resistive loads used when testing units under test are mounted on the motor load assembly. An electrical brake

and motor, used in checking the system inverter, is mounted on the SCG servo test panel (2A2A6). Also mounted on the SCG servo test panel is a fan used as a load when testing the power inverter of radar set AN/VPS-2.

b. Switch S1 is used to select various resistive loads and a motor load to check out the system inverter.

c. Switch S2 is used to select a resistive load or motor M1 as a load when testing the system inverter.

d. Switch S3 is used to select a resistive load when testing the +100 V and +19 Vdc when testing the system inverter.

e. Switch S4 applies the +26 Vdc operating voltage for the power inverter under test and also selects the output circuit of the inverter to be tested.

f. Switch S5, in conjunction with switch S4, applies a resistor or a fan as a load when checking the power inverter.

g. Switch S6 is used to select meter M4 to monitor dc current when checking either the system inverter or the radar set power inverter.

h. Switch S7 applies a normal load or a full load to the brake assembly ECL1 of motor M1 when checking the system inverter. The brake assembly ECL1 and motor M1 are located on the SCG servo test panel 2A2A6.

i. Switch S8 applies the input voltage and a resistive load to the output circuit of the ±15 Vdc power supply (converter) when checking the converter under test.

j. Switch S9 selects dc current meter M2 for use when checking either the converter or the system inverter.

k. Relay K1 applies the +24 Vdc input to the system inverter under test when switch S1 is in any ON position. The relay has a slight delay caused by the charging effect of capacitor C1 across the relay.

l. Meters M1 and M3 are constantly monitoring the input circuit current of system inverter and the radar set power inverter respectively.

m. Test points 1 through 22 are used to monitor the operation of the unit under test. Test point 23 is used to apply +19 Vdc to the converter under test.

Section III. AN/TSM-100 CIRCUIT CARD AND COMPONENT BOARD ASSEMBLIES FUNCTIONAL ANALYSIS

3-11. General. The AN/TSM-100 contains card assemblies in specific panels. The power panel (2A1A3), sight current generator test panel (2A1A1), and servo amplifier test panel (2A2A2) each contain a single circuit card assembly. The distribution box test panel (2A1A2) contains eight circuit card assemblies. The SCG servo test panel (2A2A6) contains three circuit card assemblies/ The operation of the circuits on the circuit card assemblies is described in detail in the functional analysis of the panel assembly in which they are contained (see section II). This section contains a general description of the circuits contained on each circuit card assembly and a brief analysis of the operation of the circuits. When detailed analysis of the circuits are contained in section II, reference is made to the analysis.

3-12. Power Panel Circuit Card, 2A1A3A1.

a. General. Figure FO-12 is the detailed schematic and component layout diagram for the AN/TSM-100 power panel circuit card assembly 2A1A3A1. The circuit card assembly contains most of the power panel variable frequency squarewave generator circuitry, arc suppression diodes, blocking diodes and a dropping resistor.

b. Variable Frequency Squarewave Generator. The Q1, Q2 transistor network (including resistors R1, R2, R3 and R5, capacitor C1, diodes CR15 and CR17, and four-layer diode CR16) forms most of the power panel variable frequency squarewave generator circuitry. Operating power of +24 Vdc is applied to the circuit at pin 23, and ground is applied at pin 28. The power panel FREQUENCY and PULSE WIDTH potentiometers control the voltages applied at pins 22 and 20. Pin 15 is the variable frequency squarewave generator circuit output.

c. Arc Suppression and Blocking Diodes. Diodes CR1 through CR10 are arc suppression diodes for the coils of power panel relays K1 through K10. Diodes CR12, CR13, and CR14 are blocking diodes for power panel relay K3. The blocking diodes allow +24 Vdc signals from different sources in the power panel to energize the K3 relay connected at pin 5. Diode CR11 is a spare. Power panel schematic FO-5 illustrates how the diodes are connected in specific circuits.

3-13. Sight Current Generator Circuit Card 2A1A1A1.

a. General. Figure FO-13 is the detailed schematic and component layout diagram for the AN/TSM-100 sight current generator circuit card (2A1A1A1). The circuit card assembly contains the sight current generator test panel sight cage sensing circuitry, sight current generator ready-to-fire relay K27 test circuit, and voltage divider networks to generate test signals. The circuit card assembly also contains arc suppression diodes, blocking diodes, and a feedback resistor for the sight current generator test panel, torque motor load circuit.

b. Sight Cage Sensing Circuitry. The Q2, Q3, and Q4 transistor network (including resistors R18 through R22, and diode CR5) forms the sight current generator test panel sight cage sensing circuitry. The -23 Vdc operating power is applied to the circuit at pin 8, and ground is applied at pin 28. The signal which the circuit monitors is applied at pin 12. The signal monitored is the magnet current the system SCG under test supplies to the sight current generator panel, magnet load circuit. When the signal goes to approximately -1.5 Vdc, transistor Q2 turns on. When Q2 turns on, transistor Q3, which was on, turns off. When Q3 turns off, transistor Q4 turns on, applying a ground at pin 9 to the SIGHT CAGE indicator in the sight current generator panel. The ground causes the indicator to light. Pins 2 and 11 are test points.

c. Sight Current Generator Ready-To-Fire, Relay K27, Test Circuit. The SCR Q1, resistors R15 and R16, and capacitor C1 form the SCG test panel SCG ready-to-fire relay K27 test circuit. The +24 Vdc from the SCG under test is applied through the SCG panel K27 READY TO FIRE indicator to pin 17. When relay K27 in the SCG under test is energized, a +24 Vdc signal is applied to pin 20. The +24 Vdc signal causes SCR Q1 to turn on. Turning on Q1 applies a ground to the K27 READY TO FIRE indicator at pin 17, causing the indicator to light. Capacitor C1 prevents the SCR from being turned on by electrical noise in the circuit.

d. Resistor Voltage Dividers. Resistors R13 and R14 form a voltage divider that reduces the -23 Vdc applied at pin 8 to -8.5 Vdc at pin 19. The -8.5 Vdc is applied to the LEAD ANGLE GREATER THAN 25° switch in the SCG panel. This is used to simulate a lead angle of greater than 25° signal to a SCG under test. Resistors R8, R9, and R10, and zener diode CR7 form a voltage divider that reduces +24 Vdc, applied at pin 24, to +12.3 Vdc at pin 23. The +24 Vdc is applied through R8 to CR7 where it is limited to 20 Vdc. Resistors R9 and R10 reduce the 20 Vdc to 12.3 Vdc at pin 23. The 12.3 Vdc is applied to the RANGE GREATER THAN 3000 M switch in the SCG panel and is used to simulate a range greater than 3000 meters signal to a SCG under test.

e. Arc Suppression and Blocking Diodes. Diodes CR1 and CR2 are arc suppression diodes for the coils of SCG panel relays K1 and K2. Diodes CR3 and CR8 are blocking diodes for the SCG panel K22 ACTION SWITCH indicator. The blocking diodes allow +24 Vdc signals from different sources in the SCG under test to energize the K22 ACTION SWITCH indicator connected at pin 26. SCG panel schematic, figure FO-6, illustrates how the diodes are connected.

f. Torque Motor Load Circuit Feedback Resistor. Resistor R12 is a feedback resistor in the SCG panel, torque motor load circuit.

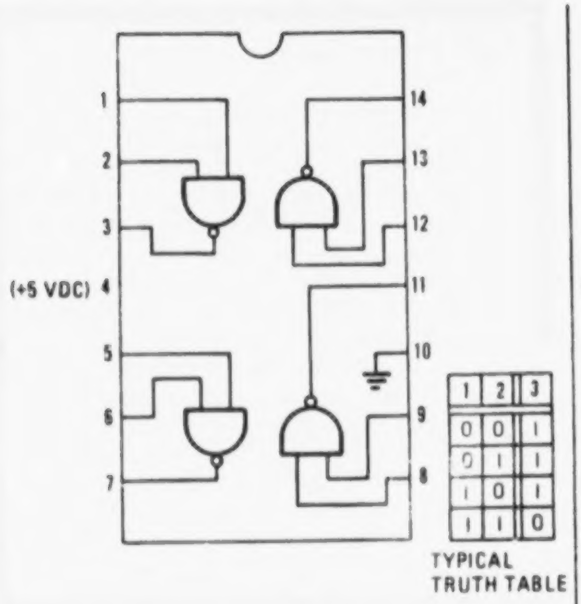
3-14. Logic Function Resistors Circuit Card, 2A1A2A1. Figure FO-14 is the detailed schematic and component layout diagram for the AN/TSM-100 logic function resistors circuit card 2A1A2A1. All the components on the circuit card assembly are resistors. Resistors R1 through R7 are used to set up logic signals for the DB test panel logic circuits. A +5 Vdc signal is applied at pin 13 and through the resistors to the logic circuits. Switches to ground are connected to the opposite sides of the resistors. When a switch is set on, a ground or logic 0 is applied to the logic circuits in place of the +5 Vdc. When the switch is set off (opened), the +5 Vdc or a logic 1 signal is applied to the logic circuits. The DB test panel schematic, figure FO-7, illustrates how the resistors are used. Resitor R9 is used to set up a time delay during system DB checkout procedures.

3-15. Relay Sense Resistors Circuit Card, 2A1A2A2. Figure FO-15 is the detailed schematic and component layout diagram for the AN/TSM-100 relay sense resistors circuit card, 2A1A2A2. All the components on the circuit card assembly are resistors. The resistors form voltage dividers. A ground is applied at pin 2. During system DB checkout procedures, +24 Vdc signals from the DB under test are applied across the resistor pairs (for instance, at pin 2). The resistor voltage dividers drop the +24 Vdc to +5 Vdc (a logic 1) for use in the DB test panel logic circuits. The voltage divider +5 Vdc outputs are located between the resistors (pin 5 for a +24 Vdc signal applied at pin 2). All other voltage dividers function in the same manner.

3-16. Relay Sense and K12 Operation Circuit Card, 2A1A2A3.

a. General. Figure FO-16 is the detailed schematic and component layout diagram for the AN/TSM-100 relay sense and K12 operation circuit card, 2A1A2A3. The circuit card assembly contains the DB K12 relay test circuits, and relay sense circuits for DB relays K6, K7, and K9. The circuits are primarily NAND gate logic circuits. The NAND gates are contained in integrated circuit modules.

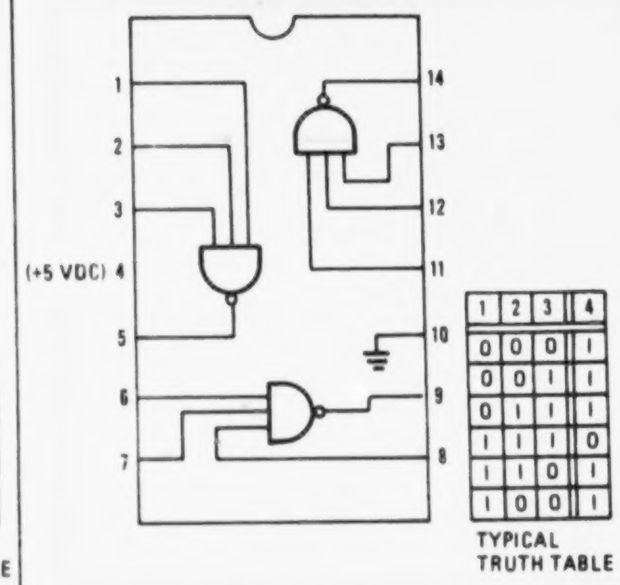
b. Integrated Circuit Modules. Figure 3-1 illustrates the two types of NAND gate integrated circuit modules used on the circuit card assembly. The modules are two-input and three-input NAND gate modules. The two-input NAND gate modules contain four NAND gates, and the three-input NAND gate modules contain three NAND gates. The relay sense and K12 operation circuit card assembly contains five integrated circuit modules, A1 through A5. A1 through A4 are two-input NAND gate modules and A5 is a three-input NAND gate module. Figure 3-1 also contains typical truth tables for each module gate. The


1
2
3
(+5 VDC) 4
5
6
7
14
13
12
11
10
9
8

1	2	3
0	0	1
0	1	1
1	0	1
1	1	0

TYPICAL TRUTH TABLE

THREE INPUT NAND GATE INTEGRATED CIRCUIT MODULE


1
2
3
(+5 VDC) 4
5
6
7
14
13
12
11
10
9
8

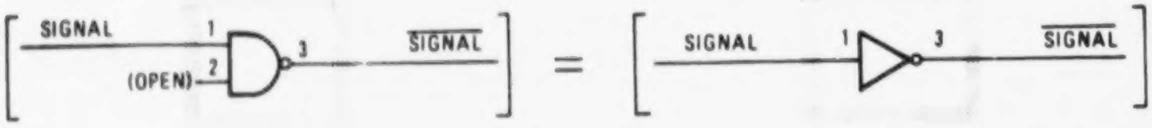
1	2	3	4
0	0	0	1
0	0	1	1
0	1	1	1
1	1	1	0
1	1	0	1
1	0	0	1

TYPICAL TRUTH TABLE

TWO INPUT NAND GATE INTEGRATED CIRCUIT MODULE

NOTES:

1. INTEGRATED CIRCUIT MODULES OPERATING VOLTAGE (+5 VDC) APPLIED AT PIN 4, AND GROUND (+5 VDC RET) APPLIED AT PIN 10.
2. ASSUME POSITIVE LOGIC OPERATION FOR ALL LOGIC GATES.
3. INTEGRATED CIRCUIT MODULE GATE LOGIC LEVELS:
   LOGIC "0" INPUT THRESHOLD = 0.9 V MAXIMUM
   LOGIC "1" INPUT THRESHOLD = 1.4 V MINIMUM
   LOGIC "0" OUTPUT LEVEL = 0.4 V MAXIMUM
   LOGIC "1" OUTPUT LEVEL = 2.5 V MINIMUM
4. ALL LOGIC GATES ARE INVERTING (REFER TO TYPICAL TRUTH TABLES).
5. A BAR OVER A LOGIC FUNCTION INDICATES INVERSION
6. WHEN ONLY ONE INPUT TO A GATE IS USED, THE GATE PERFORMS AN INVERTING FUNCTION (AN OPEN INPUT TO A GATE APPEARS TO THE GATE TO BE A LOGIC "1" APPLIED TO THE INPUT).
   EXAMPLE:


SIGNAL
1
(OPEN) 2
3
$\overline{\text{SIGNAL}}$
=
SIGNAL
1
3
$\overline{\text{SIGNAL}}$

ARR82-28631

Figure 3-1. Integrated circuit modules.

gates are inverting - all inputs must be a logic 1 to set the output to a logic 0. When only one input to a gate is used, the gate inverts the input signal.

c. Logic Latch Circuits. The circuit card assembly DB K12 relay circuits contain two logic latch circuits. Figure 3-2 illustrates a typical logic latch circuit. The latch circuit is set up to operate when the reset signal at A2-6 is momentarily set to a logic 0. The logic 0 sets A2-7 to a logic 1. The logic 1 at A2-7 is in turn applied to the A1-1 gate input. Now, when a logic 0 input signal is applied at A1-2, A1-3 is set to a logic 1. The logic 1 at A1-3 is in turn applied to the A2-5 and 6 (reset signal normally a logic 1); the gate output at A2-7 is set to a logic 0. The logic 0 at A2-7 is then applied to the A1-1 gate input. The circuit outputs at A2-7 or A1-3 are not latched. The signal at A2-7 will remain a logic 0 and the signal at A1-3 will remain a logic 1, even if the input signal changes. The logic 0 set at A1-1 holds A1-3 at a logic 1, regardless of what the input at A1-2 is. Two logic 1 inputs at A2-5 and 6 hold A2-7 (and A1-1) at a logic 0. The latch circuit is reset by again momentarily setting the reset signal at A2-6 to a logic 0.

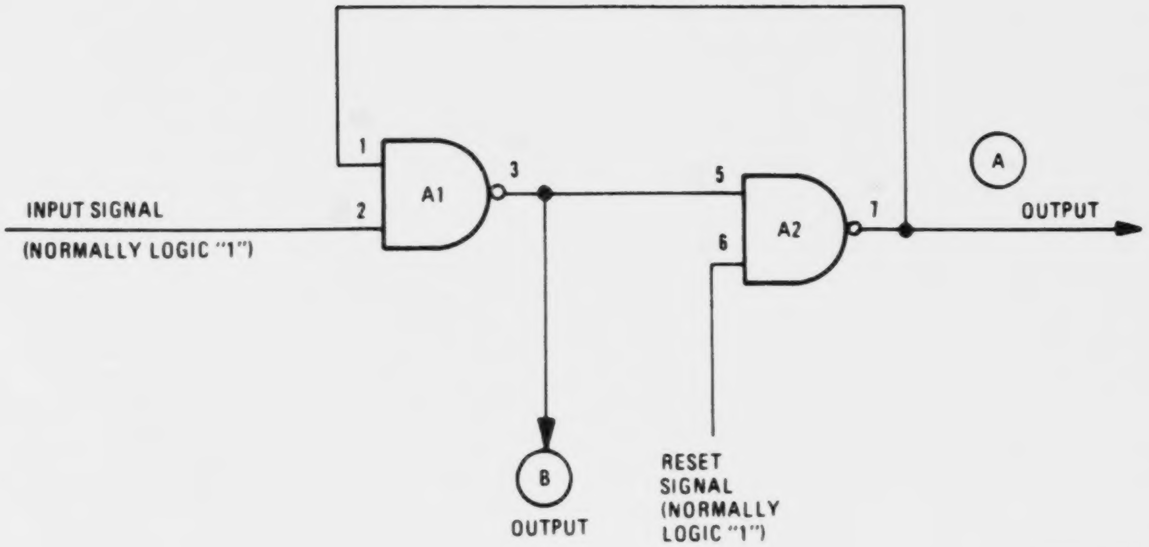
d. K12 Relay Test Circuits. Most of the components on the circuit card assembly comprise the DB K12 relay test circuits. The circuits are primary logic gates that control operation of the K12 indicator on the DB test panel. Pins 17, 18, and 26 on the circuit card assembly are test points for the DB K12 relay test circuits.

e. K6 Relay Sense Circuits. Two gates of the A1 integrated circuit module A1(8,11) and A1(12, 13, 14) form the K6 relay sense circuit. One gate is used as an inverter. The gates receive their inputs from the DB test panel relay sense resistors circuit card assembly, 2A1A2A2, and their output is applied to the DB test panel K6 operation and sequence circuit card assembly 2A1A2A4 test circuits. A detailed description of the operation of the gates is contained in the description of the DB K6 relay test circuits.

f. K7 Relay Sense Circuits. Two gates of the A2 integrated circuit module, A2 (8,11) and A2(12, 13,14), and the Q8, Q9 transistor network (including resistors R15 and R16, and diodes CR6 and CR7) form the K7 relay sense circuit. The circuit controls operation of the K7 indicator in the DB test panel. The circuit receives its inputs, at A2-8 and A2-13, from the DB test panel relay sense resistors circuit card assembly, 2A1A2A2. A logic 0 at A2-8 and a logic 1 at A2-13 indicates that relay K7 in the DB under test is energized. The signals set A2-14 to a logic 0. The logic 0 at A2-14 turns off transistor Q8, causing transistor Q9 to turn on. when Q9 turns on, a ground is applied at pin 19 to the K7 indicator causing it to light.

g. K9 Relay Sense Circuits. Two gates of the A2 integrated circuit module, A2(1, 2) and A2(5, 6, 7), and the Q6, Q7 transistor network (including resistors R13, R14 and diodes CR4, CR5) form the K9 relay sense circuit. The circuit controls operation of the K9 indicator in the DB test panel. The circuit receives its inputs, at A2-1 and A2-6, from the DB test panel relay sense resistors circuit card assembly 2A1A2A2. A logic 0 at A2-1 and a logic 1 at A2-6 indicate that relay K9 in the DB under test is energized. The signals set A2-7 to a logic 0. The logic 0 at A2-7 turns off transistor Q6, causing transistor Q7 to turn on. When Q7 turns on, a ground is applied at pin 27 to the K9 indicator causing it to light.

3-17. K6 Operation and Sequence Circuit Card 2A1A2A4. Figure FO-17 is the detailed schematic and component layout diagram for the K6 operation and sequence circuit card assembly, 2A1A2A4. The circuit card assembly entirely contains test circuits to check


1
2
3
5
6
7
A1
A2
A
OUTPUT
INPUT SIGNAL
(NORMALLY LOGIC "1")
B
OUTPUT
RESET
SIGNAL
(NORMALLY
LOGIC "1")

ARR82-28632

Figure 3-2. Typical latch circuit.

operation of the K6 relay in a DB under test. The circuits are primarily NAND gate logic circuits. The NAND gate integrated circuit modules are the same as those used on the relay sense and K12 operation circuit card, 2A1A2A3. There are four integrated circuit modules. Modules A1 and A3 are three-input NAND gate modules, and modules A2 and A4 are two-input NAND gate modules. The test circuits control operation of the K6 indicator. Pins 2, 5, 8, 9 and 10 on the circuit card assembly are test points for the circuits.

3-18. K8 Operation and Sequence Circuit Card, 2A1A2A5. Figure FO-18 is the detailed schematic and component layout diagram for the AN/TSM-100 K8 operation and sequence circuit card, 2A1A2A5. The circuit card assembly entirely contains test circuits to check operation of the K8 relay in a DB under test. The circuits are primarily NAND gate logic circuits. The NAND gate integrated circuit modules are the same as those used on the relay sense and K12 operation circuit card, 2A1A2A3. There are four integrated circuit modules. Modules A1, A2, and A3 are two-input NAND gate modules, and module A4 is a three-input NAND gate module. The circuits control operation of the K8 indicator. Pins 7, 10, 16, 19, 23 and 26 on the circuit card assembly are test points for the circuits.

3-19. K11 Operation and Sequence Circuit Card, 2A1A2A6. Figure FO-19 is the detailed schematic and component layout diagram for the AN/TSM-100 K11 operation and sequence circuit card, 2A1A2A6. The circuit card assembly entirely contains test circuits to check operation of the K11 relay in a DB under test. The circuits are primarily NAND gate logic circuits. The NAND gate integrated circuit modules are the same as those used on the relay sense and K12 operation circuit card, 2A1A2A3. There are five integrated circuit modules. Modules A1, A2, A3, and A5 are two-input NAND gate modules, and module A4 is a three-input NAND gate module. The circuits control operation of the K11 indicator. Pins 6, 10, 11, 16, 17, 18, 20, and 22 on the circuit card assembly are test points for the circuits.

3-20. Relay Time Circuit Card, 2A1A2A7.

a. General. Figure FO-20 is the detailed schematic and component layout diagram for the AN/TSM-100 relay time circuit card, 2A1A2A7. The circuit card assembly contains nine transistor switching networks Q1 through Q9.

b. Relay Time Switching Circuits. The Q1 through Q5 transistor networks control application of DB relay switching indication signals through the DB test panel RELAY TIME SELECTORS switches to DB test panel test connectors J18 and J19. The +24 Vdc operating signal is applied at pin 24, and ground is applied at pin 1. Resistor R16 and capacitor C1 filter the +24 Vdc. The +24 Vdc signals that turn on the transistors are applied through the resistor voltage dividers at the bases of the transistor (for instance, at pin 3 through the R11 / R6 voltage divider to the base of Q1). The network output is at the transistor collector. The output is normally +24 Vdc and goes to ground when the transistor is turned on.

c. Indicator Operating Circuits. The Q6 through Q9 transistor networks control operation of the DB test panel K15, K16, K13, and K14 indicators. The collectors of the transistors are normally at +24 Vdc through the DB test panel indicators. The +24 Vdc signals from the DB under test are applied to the base of the transistors when the DB relays being checked are energized. The +24 Vdc DB relay signals turn on the transistors, setting the transistor collectors to ground and causing the indicators connected to the collectors to light. The DB test panel schematic (fig. FO-7) illustrates the manner in which the transistor switching networks are used.

3-21. Noise Suppression Circuit Card, 2A1A2A8. Figure FO-21 is a detailed schematic and component layout diagram for the AN/TSM-100 noise suppression circuit card, 2A1A2A8. All the components on the circuit card assembly are capacitors. The capacitors are used to suppress electrical noise on signals in the DB test panel logic latch circuits. A ground is applied at pin 28, and the opposite sides of the capacitors connect to the latch circuits. DB test panel (fig. FO-7) illustrates how the capacitors are used.

3-22. Servo Amplifier Circuit Card, 2A2A2A1.

a. General. Figure FO-22 is a detailed schematic and component layout for the AN/TSM-100 servo amplifier circuit card, 2A2A2A1. The circuit card assembly primarily contains the tachometer feedback network. Through this network the AN/TSM-100 servo load assembly tachometer feedback signals are applied before being combined with the Servo Amplifier (SA) test panel HAND CONTROL potentiometer signals. The circuit card assembly also contains current limiting resistors and suppression diodes.

b. Tachometer Feedback Network. Resistors R3 through R9, and diodes CR1 through CR4 form the tachometer feedback network. The tachometer + and - signals are applied at pins 6 and 12. Pin 9 connects through the SA test panel TEST SELECT switch to ground when the switch is set to GRD MODE. Pins 3 and 16 are the SA test panel HAND CONTROL potentiometer inputs. The HAND CONTROL potentiometer signals are combined with the tachometer feedback signals and applied to the SA under test through pins 15 and 4.

c. Current-Limiting Resistors. Resistors R10 and R11 are current-limiting resistors connected in the SA test panel between DEAD BAND potentiometer R2 and the DEAD BAND switch settings of TEST SELECT switch S1.

d. Arc Suppression Diodes. Diodes CR5 and CR6 are arc suppression diodes for the coils of SA test panel relays K2 and K1. The SA test panel schematic (fig. FO-9) illustrates the manner in which the diodes are connected.

3-23. Control Panel Component Board Assembly, 2A2A1A1. Refer to figure FO-8 for a schematic diagram of the A1 component board. The +15 Vdc ADJUST circuit is used to regulate the 15 volt signal to the system control panel low voltage protection circuit. Power (+24 Vdc) is applied to terminal E3 and voltage regulator AR1, via R1 and R10, and to the collector of Q1. A variable dc voltage from R10-2 is applied to the base of Q1 via AR1. When voltage is applied to the base of Q1, it will conduct. The conductance of the emitter of Q1 is proportional to the saturation of Q1 base. The base saturation of Q1 is controlled by R10 and the open gain loop of AR1.

3.24. Range and Range Rate Generator Circuit Card, 2A2A6A1.

a. General. Figure FO-23 is the detailed schematic and component layout diagram for the AN/TSM-100 range and range rate generator circuit card, 2A2A6A1. The circuit card assembly contains the circuitry to feed range and range rate data to the system SCG. The card also contains a circuit to supply a regulated +12 volts to the SCG.

b. Range Data Circuitry. For the analysis of this circuitry, the direction of a simulated target must be determined. The logic 1 target direction signal is applied to pins 5 and 6. Pin 6 signal is used for outbound and pin 5 for inbound target movements. When a logic 0 is momentarily applied to pin 11 of the circuit card, Z13C has a logic 1 output applied to Z13D, Z13D has a 0 logic output and is applied at pin 13 of Z10D. Z10D logic 1 output is applied to pin 6 of Z10B, a part of the counter direction control circuit, causes a logic 1 output at pin Z10A. This logic 1 is applied at pin 4 of exclusive OR gate Z15B. Z15B has a logic 1 applied at pin 5 for the outbound direction, the output of Z15B is 0 logic. This logic 0 is applied to pin 13 of Z9D, which allows the clock pulses to appear at pin 5 of the up/down counter Z1, Z2, and Z3 counting in the upward direction. The logic 0 applied to pin 13 of Z9D is also applied to pins 5 and 6 of Z9B, a logic 1 output of Z9B is applied to pin 9 of Z9C. Z9C is locked up at a logic 1, preventing clock pulses from being applied to the up/down counter. When the counter has completed a full up count, an overflow logic 0 from pin 12 is applied to pin 1 of Z12A. Z11D, Z12A, and Z12B make up a stop pulse generator at the end of either an up count or a down count by the counter. An output logic 1 appears at pin 3 of Z12A and pin 7 of Z12B, and is applied to pin 8 of Z10C to reset the flip flop Z10C and Z10D. The logic 0 of the flip flop is applied to pin 1 of Z15A to activate the 260M preset of the counter. The up count overflow logic 0 from pin 11 of Z14B is also applied to the direction pulse generator Z11A and Z11B. The 0 logic from the counter is applied to pin 5 of Z11B, a logic 1 output is applied to pin 9 of Z11C. With both pin 8 and 9 at logic 1 the output at pin 11 of Z11C is a logic 0. This logic 0 is applied to pin 1 of Z5, and a logic 0 is applied at pin 1 of Z10A of the counter direction flip flop of Z10A and Z10B. The flip flop is reset so that a logic 0 is applied to pin 4 of Z15B. The logic 1 output of Z15B is applied to pin 13 of Z9D. This logic 1 locks up Z9D so that the clock pulses are not applied to the up count at pin 5 of the counter. The logic 1 output pulse at Z15B is also applied to pins 5 and 6 of Z9B and outputs a logic 0 at pin 7. The logic 0 at Z9C permits clock pulses to be applied to pin 4 of Z1 of the counter. The logic 0 of Z5 is also applied to pin 9 Z12C and the output of Z12D is a logic 0 turning the counter on. When the counter has completed a downward count the inputs to Z14A, Z16A through Z16C is a logic 0. This logic 0 is the stop and change direction logic previously discussed as the up count overflow logic. When logic 0 was applied to pin 11 of the circuit card, the range select flip flops Z8A and Z8B. The output of Z8A and exclusive or gate Z15C controls the output of Z13A, the output of Z13A permits the Z6 range output buffer to output range data information. At the same time the range rate select flip flop Z8C, Z8D, Z15C, and Z13B will turn off the output of the range rate buffer Z7. When logic 0 is momentarily applied to pins 11 and 45 of the circuit card, both range and range rate data is applied to connector P1 of the circuit card. Resistor R5, C3, Z15D and Z5 act as a clearing circuit for the counter just prior to the counter starting. Resistor R10, R11, R12, R13, CR1, and transistor Q1 form a regulating circuit for a regulated +12 Vdc applied at pins 3 and 4 of the circuit card.

3.25. Range D/A Converter Circuit Card 2A2A6A2.

a. General. Figure FO-24 is the detailed schematic and component layout diagram for the AN/TSM-100 range D/A converter circuit card 2A2A6A2. The circuit card assembly contains the circuitry to convert digital information to analog voltages.

b. Range D/A Converter Circuitry. The range D/A circuit is comprised of buffer amplifiers Z1 through Z3, ladder switches Z4 through Z6, and ladder networks Z7A, Z7B, and Z7C. Q1 is a bias amplifier, applying 2 to 2.2 Vdc to the buffer amplifiers. The digital input to the D/A converter is applied to the buffer amplifier. The output of the buffer amplifier is a positive voltage if the input to the buffer amplifier is a logic 0. The output of the buffer amplifier is a negative voltage if the input to the buffer amplifier is a logic 1. The ladder switch receives the output at the buffer amplifiers. The output of the ladder switches are approximately 0 Vdc if the input is a positive voltage. The ladder network is a voltage divider network. The analog output of the voltage divider is dependent on the combinations of -10 Vdc and 0 Vdc fed to the input by the ladder switch. For each bit that is a logic 1 at the input to the buffer amplifier, the corresponding input to the ladder network is -10 Vdc. For each bit that is a logic 0 at the input to the buffer amplifier, the corresponding input to the ladder network is 0 Vdc or ground return reference.

c. Buffer Operational Amplifier Circuitry. The output of the ladder network is buffered, inverted, and power amplified by operational amplifier AR3. Capacitor C6, in the feedback path of AR3, smoothes switching transients in the ladder network output signal. During positive range rates, the input to AR3 is negative and goes positive for negative range rates. Two potentiometers (+ RATE ADJ R15 and - RATE ADJ R16) provide a means of adjusting the range rate analog output to the SCG.

d. Reference Operational Amplifier Circuitry. Operational amplifiers AR1 and AR2 provide unity gain and inversion for the stable 10-volt reference voltage developed across diode VR1. In addition to supplying a -10 Volt reference voltage to the SCG, AR1 supplies the same voltage to ladder switches Z3 and Z4. REF VOLTAGE ADJ potentiometer R4 provides a means of adjusting the reference voltage output (± 10 volts) to the SCG.

3.26 Range Rate D/A Converter Circuit Card 2A2A6A3.

a. General. Figure FO-25 is the detailed schematic and component layout diagram for the AN/TSM-100 range rate D/A converter circuit card 2A2A6A3. The circuit card assembly contains the circuitry to convert digital information to analog voltages.

b. Range Rate D/A Converter Circuitry. The range rate D/A converter circuitry performs identically to the range D/A converter discussed in paragraph 3-25.b.

c. Buffer Operational Amplifier Circuitry. Buffer operational amplifier AR2 doubles and inverts the voltage divider output and, through the 5000-meter potentiometer R4, provides fine adjustment of the range voltage furnished to the SCG.

d. Reference Operational Amplifier. The reference operational amplifier doubles the 10 Vdc reference level to produce the +20 Vdc reference output, which is furnished to the SCG.

CHAPTER 4

OPERATOR/CREW MAINTENANCE INSTRUCTIONS

4-1. Preventive Maintenance Checks and Services

a. General. To make sure the AN/TSM-100 test set is in maximum operational condition, it is necessary that the equipment be periodically checked and serviced. Table 4-1 lists the preventive maintenance checks and services required. The table also contains time intervals and references.

b. Inspection.

(1) Inspection for damaged components consists of a general visual inspection to determine if the equipment is too severely damaged for safe operation. Inspect for broken, cracked, bent or dented components. Replace the damaged components.

(2) Inspection for excessive wear consists of a general visual inspection to determine if the equipment is worn beyond serviceable limits, or to a point where use is impaired. Inspect for bare, frayed, or chafed components. Especially check the cable assemblies and wiring insulation. Check all AN/TSM-100 panels and the adapter for illegible markings. Replace, paint, or mark equipment as necessary.

(3) Inspection for proper installation is a visual inspection to make sure that all parts are present, in their correct relative position, and tightly secured. Inspection that parts are tightly secured is usually a visual check, or a check by hand or wrench for tightness. Such an inspection should include test panel assemblies, circuit card assemblies, brackets, fasteners, clamps, tubes, cables, and wires. Install components properly or tighten as necessary.

(4) Inspection for fouling or corrosion consists of a general visual inspection to determine if the equipment is deteriorated beyond use, or contaminated to a point where use is impaired. Inspect for dust, dirt, any other type of fouling, rust or corrosion. If an assembly or component is deteriorated beyond use, replace the assembly or component. If an assembly can be cleaned, clean the assembly as soon as possible to avoid further deterioration.

c. Cleaning. The AN/TSM-100 test set components are to be periodically cleaned every three months or whenever a visual inspection reveals component contamination. Some standard general cleaning procedures and precaution are given in the following paragraphs.

WARNING

Dry cleaning solvent or mineral spirits paint thinner is flammable and should not be used near an open flame. Fire extinguishers should be provided when these materials are used. Use only in well-ventilated areas.

(1) Use dry cleaning solvent (Item 4, Appendix D) or mineral spirits paint thinner (Item 5, Appendix D) to clean or wash fouling from all metal parts.

(2) These cleaners evaporate quickly and have a drying effect on the skin. If used without gloves, they may cause cracks in the skin, and in the case of some individuals, may cause a mild irritation or inflammation.

(3) Avoid getting petroleum products, such as dry cleaning solvent, mineral

spirits paint thinner, or lubricants, on rubber parts as the rubber will deteriorate.

(4) The use of diesel fuel oil, gasoline, or benzene for cleaning is prohibited.

(5) The use of water, steam, or compressed air for cleaning is prohibited.

(6) After parts are cleaned, rinse and dry them thoroughly. Apply light grade of oil (item 6, Appendix D) to all unprotected metal surfaces to prevent rusting.

d. Painting. Repaint painted surfaces as required to cover nicks, scratches, and worn spots which expose bare metal. Complete repainting is not necessary. General painting instructions are contained in TM 43-0139.

e. Lubrication. The only lubrication necessary is to lubricate the motor load assembly (2A2A4A1) gears. The gears should be inspected for the presence of grease at least every six months. If no grease is visible, lubricate the gear teeth lightly with grease (item 1, Appendix D).

CAUTION

Apply only a light coat of grease to the gear teeth. An excessive amount of grease may cause spraying of grease within the assembly when the motor load assembly is being operated.

The motor load assembly motors and bearings are sealed and require no lubrication.

Table 4-1. Preventive Maintenance Checks and Services (PMCS) Procedures

NOTE: These checks are to be performed in the order listed within designated intervals.

B - Before
W - Weekly
M - Monthly
C - Combat Operability Check
Q - Quarterly

Item no.	Interval B	W	M	Q	C	Item to be inspected	Procedures	Equipment will be reported Not Ready (Red) if:
1	●					AN/TSM-100	Check for damaged components.	Broken indicating meters
2	●					AN/TSM-100	Check for proper installation and that all parts are securely mounted.	
3	●					AN/TSM-100	Check for dirt, corrosion and excessive wear.	
4	●					AN/TSM-100	Check that calibration stickers are properly dated.	
5		●				AN/TSM-100	Check battery assemblies for damage, corrosion and proper electrolyte level.	Battery electrolyte low.
6				●		AN/TSM-100	Test and troubleshoot, or after repair.	

CHAPTER 5

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Organizational maintenance instructions are not applicable. AN/TSM-100 usage and maintenance is a direct support personnel function.

CHAPTER 6

DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF MATERIEL

6-1. Service on Receipt of Packaged Materiel. If the AN/TSM-100 test set is received packaged, perform the following procedures in the order indicated to install the AN/TSM-100 in the AN/TSM-115 shelter.

a. Console Installation. Unpack the AN/TSM-100 console, and visually inspect it for damage. Check the console for completeness, and see that the console components are mounted securely.

NOTE

> The AN/TSM-100 console is normally packaged with the internal cable assemblies, motor load assembly components, the inverter, and the ±15 Vdc power supply mounted in the console. Table 1-2 lists the AN/TSM-100 internal cable assemblies W120 through W124 and W201 through 204. Table 1-1 lists the inverter/converter test panel (2A2A4) components.

Remove the panel access covers as necessary to observe the components. Secure the AN/TSM-100 console in the proper position, on the right of the AN/TPM-22 Radar Test Set, in the AN/TSM-115 shelter. Mount the horizontal stringers on the rear of the console. Make sure that they are hooked over the shelter wall stringers, and that the console is seated firmly on the shock absorbing pad. Check that the console is secured to the shelter by attempting to rock it in its mounting. Remove all covers and tape from the console.

b. Battery Charger Installation. Unpack the AN/TSM-100 battery charger (2A1A4), and remove any covering and tape on the assembly. Check for damage. Refer to figure 1-1 and set the battery charger in the AN/TSM-100 console on its mounting rails. Connect the battery charger terminal lugs on the console W120 internal cable assembly to the appropriate barrier strip terminals at the rear of the battery charger. Refer to figure FO-5 and check connections by checking the continuity from the battery charger terminals to the appropriate pins on the W120-P108 internal cable connector. After connections are made and checked, slide the battery charger all the way into the AN/TSM-100 console. Secure the battery charger in the console with its four mounting screws.

c. Power Panel Installation. Unpack the AN/TSM-100 power panel (2A1A3). Remove any covering and tape on the assembly and check for completeness and damage. Refer to figure 1-1 and mount assembly on its extension slides. To install assembly, extend the extension track slides on which it mounts in the AN/TSM-100 console. Depress the spring-loaded track locks on the assembly and slide the assembly onto the extended console track slides. Continue sliding the assembly along the tracks until the tracks lock. Refer to figure 1-2 and connect the appropriate internal cable assembly connectors to the five connectors on the rear of the power panel. After connections are made, depress the track locks and slide the power panel all the way into the AN/TSM-100 console. Secure the power panel in the console with the four spring-loaded fasteners.

d. Sight Current Generator, Distribution Box, Servo Amplifier Panel, and SCG Servo Test Panel Installation. Unpack the AN/TSM-100 SCG panel (2A1A1), distribution box panel (2A1A2), servo amplifier panel (2A2A2), and SCG servo test panel (2A2A6). Remove any covering and tape on the assemblies and check each for completeness and damage. Each assembly mounts in the AN/TSM-100 console in the same manner as the power panel (2A1A3) described above. Refer to figure 1-1 for proper location. Before securing the assemblies in the console, refer to figure 1-2 and connect the appropriate console internal cable assembly connectors to the assemblies.

e. Counter Installation. Unpack the AN/TSM-100 counter (2A2A3), and remove any covering and tape on the assembly. Check for damage. Refer to figure 1-2 and connect the console internal cable assembly connector W120-P116 to the J116 connector on the rear of the counter. Connect internal cable W153-P2 to CHAN B jack and cable W152-P2 to CHAN A jack on the rear of the counter. Set the counter on its mounting rails and slide the counter all the way into the AN/TSM-100 console. Secure the counter in the console with the four mounting screws and washers.

f. Control Panel Installation. Unpack the AN/TSM-100 control panel (2A2A1), and remove any covering and tape on the assembly. Check for completeness and damage. Refer to figure 1-2 and connect the console internal cable assembly connector W122-P114 to the J114 connector on the back of the assembly. Mount assembly in the AN/TSM-100 console by holding it in place against the console and securing the fasteners. Refer to figure 1-1 for proper location.

g. Inverter/Converter Test Panel Installation. Unpack the AN/TSM-100 inverter/converter test panel (2A2A4), and remove any covering and tape on the assembly. Check for completeness and damage. Mount the assembly in the AN/TSM-100 console by holding it in place against the console and securing the fasteners. Refer to figure 1-1 for proper location.

h. Power Connections. Make sure that all ON/OFF switches on the AN/TSM-100 panel assemblies are set to OFF. Connect the AN/TSM-100 external shelter power cable W125 between J101 connector on top of the AN/TSM-100 and 115 Vac power socket outlet on the AN/TSM-115 shelter wall. Remove the access panel cover on front of the MX-8050/TPM-22 card reader assembly; detach MX-8050/TPM-22 card reader assembly and raise up to the extended position. Connect the AN/TPM-22 Radar Test Set P20 cable connector, under the MX-8050/TPM-22 card reader assembly, to the W121-J28 cable connector on the lower left-hand side of the AN/TSM-100.

i. Battery Installation. Normally the AN/TSM-100 battery assemblies (2A1A5A1 and 2A2A5A1) and the AN/TSM-100 are shipped separately. Refer to paragraph 6-33 for procedures to install the battery assemblies.

j. Checkout Procedures. Perform the checkout procedures given in paragraphs 6-2p through 6-2t in the order indicated.

6-2. Service on Receipt of Materiel Mounted in AN/TSM-115 Shelter. If the AN/TSM-100 test set group is mounted in the AN/TSM-115 shelter, perform the following procedures in the order indicated.

a. Make sure that all ON/OFF switches on the AN/TSM-100 are set to OFF.

NOTE

Normally the AN/TSM-100 battery assemblies are shipped discharged and removed from the AN/TSM-100. Procedures to inspect, charge, and install the battery assemblies are contained in paragraph 6-33 of this chapter and are referenced in the following procedures.

b. Remove all AN/TSM-100 accessories. Visually inspect all AN/TSM-100 components for damage. Slide out the AN/TSM-100 panel assemblies, as necessary, to make inspections. Check for broken, cracked, bent, twisted, or frayed components. Check for dirt, scratches, worn spots, or illegible markings. Replace any damaged components and clean, paint, or mark as necessary.

c. Visually inspect all AN/TSM-100 major assemblies for missing parts. Slide out the AN/TSM-100 panel assemblies, as necessary, to make inspections.

d. Make sure that all AN/TSM-100 internal cable connectors are connected and that cables are secured by their clamps. Slide out the panel assemblies individually to make checks. Refer to figure 1-2 and check that each connection shown is made. Hand tighten each connector to make sure that it is mated properly.

e. Slide out the SCG panel (2A1A1), distribution box panel (2A1A2), power panel (2A1A3), servo amplifier panel (2A2A2), and SCG servo test panel (2A2A6) one at a time, and make sure that all circuit card assemblies are seated tightly in their connectors. Apply slight downward pressure with the thumbs on the top edges of each circuit card assembly until each card is properly seated.

f. Slide out counter (2A2A3) far enough to reach in back of the counter. Behind the counter, set INT STD-EXT STD switch to INT, and INTERNAL-EXT ARM-EXT gate switch to INTERNAL. Slide the counter back into the AN/TSM-100.

g. At the brake motor and tachometer assembly, make sure that the motor load assembly (2A2A4A1) brakes are set in the off position (brake release levers on the front of the motors set perpendicular to the axes of the motor shafts).

h. Inspect the brake motor load assembly gears for grease on the gears. If no grease is visible, refer to paragraph 2-8 and grease the gear teeth with grease (MIL-G-21164) (item 1 Appendix D).

i. Make sure that all AN/TSM-100 identification and warning plates are in place. Table 1-6 lists the location of the plates.

j. Check all parts by hand or wrench for tightness. Check brackets, plates, switches, potentiometers, mounting hardware, and cables. Tighten as necessary.

k. Slide all panel assemblies back into the console and secure them. The test panel assemblies and power panel are secured to the console with spring-loaded fasteners. The battery charger and counter are secured to the console with screws and washers. Make sure that all assemblies are tightly secured. Replace the inverter/converter test panel and secure tightly in place.

l. Make sure that the shelter power cable W125 is connected between J101 connector on top of the AN/TSM-100 and the 115 Vac power socket outlet on the shelter wall.

m. Remove the access panel cover on the front of the MX-8050/TPM-22 card reader assembly and raise to the extended position. Make sure that the AN/TPM-22 Radar Test Set P20 cable connector is tightly mated to the W121-J28 cable connector on the lower left-hand side of the AN/TSM-100. Replace the MX-8050/TPM-22 card reader assembly and access cover.

n. Refer to paragraph 6-33 of this chapter and inspect, charge, and install the AN/TSM-100 battery assemblies (2A1A5A1 and 2A2A5A1).

o. Inspect battery assemblies venting hose for twists or cracks. Straighten or replace the venting hose if necessary. Make sure that the venting hose is tightly clamped to both battery assembly cover venting hose adapters, and to the exit vent pipe in the wall of the shelter behind the AN/TSM-100. Tighten the clamps as necessary. Replace battery assembly access panels, and secure tightly in place.

p. Perform a general operational check of the AN/TSM-100 by performing the procedures described in AN/TSM-100 Turn-On Procedures, table 2-9, in the sequence given.

q. Perform each panel assembly checkout procedure contained in tables 6-16 through 6-28.

r. Perform battery charger (2A1A4) and counter (2A2A3) checkout procedures described in manufacturer manuals (appendix A) furnished with the equipment. The 115 Vac operating power is supplied to both the battery charger and counter by setting the AN/TSM-100 power panel (2A1A3) 115V 400CY 1 PHASE switch to ON.

s. Unpack the AN/TSM-100 accessory equipment (adapters and extender boards) and visually inspect for damage. Refer to table 1-3 and check that all accessory equipment is present. Perform the accessory equipment test procedures described in paragraph 6-29.

t. Unpack the AN/TSM-100 external test cables, and visually inspect for damage. Check for missing cable identification tags and broken or bent connector pins. Refer to table 1-4 and check that all test cables are present.

Section II. PREEMBARKATION

6-3. General. Preparation for travel applies to the AN/TSM-100 where mounted in the AN/TSM-115 shelter. No special preparation is required, but the following general steps should be taken:

a. Place all accessory equipment and group test cables in the storage drawers, and appropriate storage areas in the shelter.

b. Secure the drawers in the closed position with the captive front panel screws.

c. Make sure the battery is disconnected and tie-down assemblies are tight and secure.

d. Make sure that all drawer and panel assemblies are securely fastened in place by checking all the captive front panel screws.

Section III. TEST AND TROUBLESHOOTING PANEL ASSEMBLIES

6-4. Introduction. This section provides detailed test/troubleshooting instructions for test panel assemblies in the AN/TSM-100, and for all circuit card assemblies used in the test panel assemblies. This section also contains general test and troubleshooting instructions for accessory equipment used in the AN/TSM-100. The battery charger 2A1A4, and ±15 Vdc power supply 2A2A5A2 are not repairable at the DS level of maintenance. Test procedures only have been included in this section for inverter 2A1A5A2, ±15 Vdc power supply 2A2A5A2, and inverter 2PS1.

6-5. Test Equipment Required. Refer to table 6-1 for a complete list of test equipment required to test and troubleshoot the AN/TSM-100.

6-6. Instructions for Use of Test Panel Assembly Test and Troubleshooting Tables. Test and troubleshooting procedures for test panel assemblies are contained in tables 6-2 through 6-13. Where possible, test and troubleshooting procedures are combined in a single table. A separate table is used for troubleshooting procedures not readily combined with test procedures. The power panel assemblies 2A1A3, 2A1A4, and 2A1A5 should be checked first to assure that power is available to the AN/TSM-100. The test procedures assume that the AN/TSM-100 (UNIT 2) is completely assembled and interconnected, including the interface connections to the AN/TPM-22 Radar Test Set (UNIT 1). Instructions for use of the tables are contained in the following paragraphs.

a. Test Tables. The test tables contain five columns, headed and described as follows:

(1) Step. The number placed in this column is used for reference purposes and provides a logical sequence for test and troubleshooting.

(2) Procedure. This column provides the instructions necessary to complete the step. Perform all instructions for a step and check for the indication given in the "Normal indication column". If the indication is as specified, proceed to the next step. If the indication is not as specified, proceed to the column headed "If indication is abnormal".

(3) Normal Indication. This column provides a description of the normal indication(s) which should be observed after completion of the instructions in the "Procedure" column.

(4) If Indication is Abnormal. This column provides further instructions to determine the cause of an abnormal indication or refers to steps in a fault isolation table. When the cause of an abnormal indication is isolated to a circuit card assembly, reference is made to the test and troubleshooting table for that circuit card.

(5) Reference for Abnormal Indication. Diagrams and other helpful information related to troubleshooting are identified in this column.

b. Troubleshooting tables. The troubleshooting tables contain five columns, headed as follows:

(1) Step. The number in this column is the step to which reference is made from the checkout table for further troubleshooting to the component level.

(2) Procedure. This column provides a continuance of procedures from the test table for further troubleshooting. Perform all instructions for a step and check for the indication given in the "Normal indication" column. If the indication is as specified, perform the instructions given in the "If indication is normal" column. If the indication is not as specified, perform the instructions given in the "If indication is abnormal" column.

(3) Normal indication. This column provides a description of the normal indication(s) to be observed. Indications observed on other parts of the equipment have no value to the test and should not be noted.

(4) If Indication is Normal. This column provides further instructions for fault isolation if a normal indication is observed or gives instructions to proceed to another step.

(5) If indication is Abnormal. This column provides further instructions for fault isolation if the indication observed is not as specified in the "Normal Indication" column.

Table 6-1. Test Equipment Required for AN/TSM-100 Test and Troubleshooting Procedures

Equipment name	AN type, part number or manufacturer's designation	Use
Multimeter	Model AN/USM-486	Precision voltage and resistance measurements
Oscilloscope	Model OS-261/U	Waveform measurement
Test set, radar (unit 1)	AN/TPM-22	Provides test voltages of specific tests
Chart Recorder	Model 7402A option 137	Plot power series voltage outputs
Electrical Test Set	Type 1502-1	Test of cables

Table 6-2. Power Panel 2A1A3, Test Procedures

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
1	AN/TSM-100: set all ON/OFF switches to OFF position, and all circuit breakers reset or pressed in. NOTE Make sure all TSM-115 shelter outlet circuit breakers are set to ON.			
2	AN/TPM-22 radar test set (UNIT 1): set TEST MODE switch, on power supply (1A1A4), to FC CONSOLE and depress +24 VDC ON/OFF switch to ON.	115V 400 CPS ON legend lights.		
3	Battery charger (2A1A4): observe voltmeter.	0 Vdc	Check CR1 for short	Fig. FO-3, fig. FO-5
4	At power panel (2A1A3) set 115V 400 CY 1 PHASE ON/OFF switch (S4) to ON.	115V 400 CY 1 PHASE indicator (DS3) lights.	If CKT BKR 1 (CB4, 1A) opens, check load side for shorted condition 115VAC + (TP6) to 115VAC GRD (TP7). If CKT BKR 1 does not open perform troubleshooting procedure in table 6-3, step A.	Fig. FO-3, fig. FO-5 Fig. FO-3, fig. FO-5

Table 6-2. Power Panel 2A1A3, Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
5	Measure voltage (ac) between 115VAC + (TP6) and GRD (TP7) test points.	108 to 132 Vac.	Perform troubleshooting procedures, table 6-3, step B.	Fig. FO-3, fig. FO-5
6	Counter (2A2A3): Set POWER ON/STANDBY switch to ON.	Counter display lights.	Check out power source and counter.	Counter manual.
7	Battery charger (2A1A4): Set AC-ON switch to ON.	Battery charger AC indicator lights.	Check out battery charger.	Battery charger manual.
8	Battery charger: Make sure MODE CURRENT ADJUST control is set fully clockwise. Observe VOLTS DC meter and AMPERES DC meter.	Battery charger ammeter indicates a charging current, and voltmeter indicates a charging voltage between +27.0 to +27.5 Vdc. NOTE If operating in extreme cold temperatures, charging voltage may be set to greater than +27.5 Vdc. Refer to table 6-33 for proper upper limit for charging voltage in extreme cold temperatures.	Adjust battery charger MODE VOLTAGE ADJUST control to set charging voltage to the proper indication. Perform troubleshooting procedures, table 6-3, step C.	Fig. FO-3, fig. FO-5

Table 6-2. Power Panel 2A1A3, Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
9	Set DISTRIBUTION switch (S1) to +24VDC ONLY. Set DISTRIBUTION +24VDC ON/OFF switch (S2) to ON.	+24VDC indicator (DS 4) lights.	If CKT BKR 50 (CB2, 50A) opens, perform troubleshooting procedures, table 6-3, step F.	Fig. FO-3, fig. FO-5
			If CKT BKR 50 does not open, perform troubleshooting procedures in table 6-3, step G.	Fig. FO-3, fig. FO-5
10	Set DISTRIBUTION switch (S1) to SIGHT CUR GEN.	INVERTER indicator (DS1) and UNIT NO. 1 indicator (DS2) light. On power supply PP-6324 +24 Vdc ON legend lights.	If CKT BKR 50 (CB2, 50A) opens, perform troubleshooting procedures, table 6-3, step H.	Fig. FO-3, fig. FO-5
			If CKT BKR 10 (CB1, 10A) opens, perform troubleshooting procedures, table 6-3, steps K and L.	Fig. FO-3, fig. FO-5
			If INVERTER indicator (DS1) does not light, perform troubleshooting procedures, table 6-3, step M.	Fig. FO-3, fig. FO-5
			If UNIT NO. 1 indicator (DS2) does not light, check DISTRIBUTION switch, S1-B1, K2 relay coil and contacts, and	Fig. FO-3, fig. FO-5

Table 6-2. Power Panel 2A1A3, Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
10 (cont)			UNIT NO. 1 indicator (DS2) for open condition. If power panel components check properly, perform power supply PP-6324 (1A1A4) test procedure in Radar Test Set AN/TPM-22 manual.	
11	At sight current generator (2A1A1): Set SYSTEM POWER ON/OFF switch to ON.	Sight current generator panel SYSTEM POWER indicator lights.	If CKT BKR 5 (CB3) (power panel) opens, perform sight current generator panel test.	Fig. FO-3, fig. FO-5
			If CKT BKR 5 does not open, perform troubleshooting procedures, table 6-3, step N.	Fig. FO-3, fig. FO-5
12	At sight current generator panel: Measure voltage (ac) between TEST POINTS 6(+) and 7(-).	108 to 132 Vac.	Perform troubleshooting, table 6-3, step O.	Fig. FO-3, fig. FO-5

Table 6-2. Power Panel 2A1A3, Test Procedures - Continued

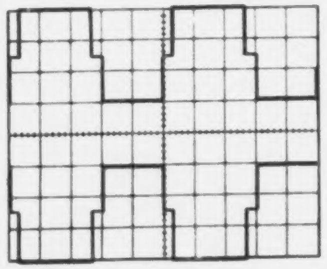
Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
13	Set oscilloscope controls as follows: VERT MODE to ALT, CH1 and CH2 VOLTS/DIV to 5, TIME/DIV to .5m. Remove ground leads from X10 probes. Connect CH1 and CH2 to TEST POINTS 4 and 5 respectively on SCG.	126 to 154 V p-p: 396 to 404 Hz, quasi-square wave. 180° out of phase 	Perform troubleshooting, table 6-3, steps Q and R in sequence.	Figs. FO-5 and FO-6, sheet 1, fig. FO-3
14	Sight current generator panel: Measure voltage (-dc) between TEST POINTS 1(+) and 2(-).	+17.43 to +19.47 Vdc.	Perform troubleshooting, table 6-3, steps S and T in sequence.	Figs. FO-5 and FO-6, sheet 1, fig. FO-3
15	SCG servo test panel (2A2A6): Set POWER ON/OFF switch to ON.	SCG servo test panel POWER indicator lights.	Perform test in table 6-11.	Fig. FO-10
16	Set DISTRIBUTION switch (S1) to DB.	INVERTER indicator (DS1) goes out.	If INVERTER indicator (DS1) stays lit, check K3 relay contacts (3 and 5) or DISTRIBUTION switch (S1-A1 to S1-A2) for shorted condition.	Fig. FO-3, fig. FO-5
		UNIT NO. 1 indicator (DS2) remains lit.	If UNIT NO.1 indicator (DS2) goes out, check DISTRIBUTION switch (S1-B2) for open condition.	

Table 6-2. Power Panel 2A1A3, Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
16 (cont)		Sight current generator panel SYSTEM POWER indicator (DS12) goes out. SCG servo test panel indicator goes out.	If sight current generator panel SYSTEM POWER indicator stays lit, check power panel (2A1A3) K7 relay contacts (3 and 5) for shorted condition. If power panel CKT BKR 50 (CB2-50A) opens, perform troubleshooting, table 6-3, step V.	
17	Distribution box panel (2A1A2): Set TEST SYSTEM POWER +5 VDC and +24 VDC ON/OFF switches to ON.	At distribution box panel: +5 VDC and +24 VDC indicators light.	If power panel CKT BKR 5 (CB3) opens, perform distribution box panel (2A1A2) test procedures, table 6-6.	Fig. FO-7
			If distribution box panel +5 VDC indicator does not light check distribution box panel 0.5 AMP fuse (F1) for open condition.	Fig. FO-7
			If distribution box panel fuse checks properly, perform troubleshooting procedures, table 6-3, step U.	

Table 6-2. Power Panel 2A1A3, Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
17 (cont)			Check K8 relay coil and contacts, and DISTRIBUTION switch (S1-A2) for open condition. Perform distribution box panel test procedures, table 6-6.	Fig. FO-5
18	Set DISTRIBUTION switch (S1) to SVO AMPL.	UNIT NO. 1 indicator (DS2) goes out.	If UNIT NO. 1 indicator (DS2) stays lit, check K2 relay contacts (A1 and A2) for shorted condition.	Fig. FO-5
			If CKT BKR 50 (CB2, 50A) opens, perform troubleshooting procedures, table 6-3, step V.	Fig. FO-5
		Distribution box panel +5VDC and +24VDC indicators go out.	If distribution box panel +5 VDC and +24 VDC indicators stay lit, check K8 relay contacts (3 and 5) for shorted condition.	Figs. FO-3 and FO-5
19	Servo amplifier panel (2A2A2): Set POWER ON/OFF switch to ON.	Servo amplifier panel +24 VDC indicator lights.	If power panel CKT BKR 50 (CB2) opens, perform servo amplifier panel test procedures, table 6-9.	Fig. FO-9

Table 6-2. Power Panel 2A1A3, Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
19 (cont)			Check power panel K9 relay coil and contacts, and DISTRIBUTION switch (S1-A3) for open condition.	Fig. FO-5
			Perform servo amplifier panel test, table 6-9.	
20	Set DISTRIBUTION switch (S1) to CONT PNL.	Servo amplifier panel +24 VDC indicator goes out.	If power panel CKT BKR 50 (CB2, 50A) opens, perform troubleshooting procedures, table 6-3, step X.	Fig. FO-5
			Check K9 relay contacts (A1 to A2) and (B1 to B2) for shorted condition.	Fig. FO-5
21	Control panel (2A2A1): Set POWER ON/OFF switch to ON.	Control panel +24 VDC indicator lights.	If power panel CKT BKR 5 (CB3) opens, perform control panel test and troubleshooting procedures, table 6-8.	Fig. FO-8
			Check K10 relay coil and contacts, and DISTRIBUTION switch (S1-A4) for open condition.	Fig. FO-5
			Perform control panel test and troubleshooting procedures, table 6-8.	Fig. FO-8

Table 6-2. Power Panel 2A1A3, Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
22	Set DISTRIBUTION switch (S1) to AN/MWW-2.	INVERTER indicator (DS1) lights.	If power panel CKT BKR 50 (CB2, 50A) opens, perform troubleshooting procedures, table 6-3, step Y.	Fig. FO-5
			If INVERTER indicator (DS1) does not light, perform power panel circuit card assembly (2A1A3A1) test and troubleshooting procedures, table 6-16.	Fig. FO-12
		Control panel +24 VDC indicator goes out.	If control panel +24 VDC indicator stays lit, check K10 relay contacts (3 to 5) for shorted condition.	Fig. FO-5
23	At power panel (2A1A3) measure voltage (dc) between 15VDC +(TP8) and GRD (TP10).	+14.25 to +15.75 Vdc.	Perform troubleshooting procedures, table 6-3, step Z.	Fig. FO-5
24	Measure voltage (dc) between 15VDC -(TP9) and GRD (TP10).	-14.25 to -15.75 Vdc.	Perform troubleshooting procedures, table 6-3, step AB.	Fig. FO-5

Table 6-2. Power Panel 2A1A3, Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
25	Measure voltage (dc) between each + OUTPUT TO AN/MWM-2 test point (TP14 and TP15) and 15VDC GRD test point (TP10) while rotating +OUTPUT ADJUST control through its full range.	Voltage level varies smoothly from 0 to +15 Vdc (at full range).	Check + OUTPUT ADJUST potentiometer (R7) for proper alignment and operation.	Fig. FO-5
26	Measure voltage (dc) between each - OUTPUT TO AN/MWM-2 test point (TP12 and TP13) and 15 VDC GRD test point (TP10) while rotating - OUTPUT ADJUST control through its full range.	Voltage level varies smoothly from 0 to -15 Vdc (at full range).	Check - OUTPUT ADJUST potentiometer (R6) for proper alignment and operation.	Fig. FO-5
27	AN/TPM-22 Radar Test Set (UNIT 1): Set power supply (1A1A4) TEST MODE switch to PWR SUP/SERVO.	No indications.		
28	At power panel (2A1A3) set DISTRIBUTION switch (S1) to UNIT NO. 1.	UNIT NO. 1 and INVERTER indicators (DS2 and DS1) light.	If AN/TPM-22 Radar Test Set (UNIT 1) power supply (1A1A4) CONTROL CKT circuit breaker opens, perform troubleshooting procedures, table 6-3, steps AD and AE in sequence. If UNIT NO. 1 indicator (DS2) does not light, perform troubleshooting procedures, table 6-3, step AF.	Fig. FO-4 Fig. FO-4

Table 6-2. Power Panel 2A1A3, Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
28 (cont)			If INVERTER indicator (DS1) does not light, perform troubleshooting procedures, table 6-3, step AG.	Fig. FO-4
29	At AN/TPM-22 Radar Test Set (UNIT 1) power supply and servo test panel (1A1A3), depress SERVO 115V 400CPS ON/OFF indicator switch to ON.	At AN/TPM-22 Radar Test Set (UNIT 1) power supply and servo test panel SERVO 115V 400 CPS ON/OFF indicator lights ON.	Perform troubleshooting procedures, table 6-3, step AH.	Fig. FO-4
30	At AN/TPM-22 Radar Test Set (UNIT 1) power supply and servo test panel depress 280V ϕ(B) +15V -15V indicator switch.	At AN/TPM-22 Radar Test Set (UNIT 1) power supply and servo test panel 280V ϕ(A) 280V ϕ(B) +15V -15V indicator lights.	If AN/TPM-22 Radar Test Set (UNIT 1) power supply (1A1A4) CONTROL CKT circuit breaker opens, perform troubleshooting procedures, table 6-3, steps AI and AJ in sequence. Perform troubleshooting procedure, table 6-3, step AK.	Fig. FO-4
	At power panel (2A1A3) set DISTRIBUTION switch to RADAR NOISE. At AN/TPM-22 radar test set (UNIT 1) set power supply (1A1A4) TEST MODE switch to RCVR/XMTR.	UNIT NO. 1 and INVERTER indicators light.	Perform troubleshooting procedures, table 6-3, step M.	Fig. FO-5

Table 6-2. Power Panel 2A1A3, Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
30 (cont)		Sight current generator panel SYSTEM POWER indicator lights.	Check DISTRIBUTION switch S1-B1, K2 relay contacts and UNIT NO. 1 indicator for OPEN condition.	Fig. FO-5
		SCG servo test panel POWER indicator lights MX-8046A power indicator lights.	Check DISTRIBUTION switch S1-A1, A7 and S1-B6, B7; K2 relay contact and SYSTEM POWER indicator for open condition.	
31	At SCG servo test panel set AMPL ON/OFF switch to ON.	AMPL ON/OFF indicator (DS20) lights.	Check indicators and wiring.	Fig. FO-5, fig. FO-10
32	At power panel (2A1A3) measure voltage between +24VDC + test point (TP4), (controlled by the +24VDC ON/OFF switch (S3), and +24 VDC GRD (TP5)). Set +24 VDC ON/OFF switch to OFF position and then to ON position.	0 Vdc with +24VDC ON/OFF siwtch (S3) in OFF position. +22 to +28 Vdc with +24VDC ON/OFF switch (S3) in ON position.	Check +24VDC ON/OFF switch (S3) for proper operation.	Fig. FO-5
33	At convenience connector (26) (left side of AN/TSM-100, measure voltage (dc) between pins A (+) and B (-).	+22.0 to +28.0 Vdc.	Check convenience connector (J26) for open condition.	Fig. FO-3

Table 6-2. Power Panel 2A1A3, Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
34	At convenience connector (J27), measure voltage (dc). Refer to fig. FO-5 for J27 orientation if necessary.	+22.0 to +28.0 Vdc.	Check convenience connector (J27) for open condition.	Fig. FO-3
35	At power panel set DISTRIBUTION +24 Vdc ON/OFF switch to OFF. Remove access cover from battery and inverter (2A1A5) and power supply (2A2A5). Disconnect cable (W123-P113) from left hand battery. Set DISTRIBUTION +24 Vdc ON/OFF switch to ON.			
36	At battery charger (2A1A4) set AC-ON switch to off position.	At battery charger AC indicator goes out.		
37	At power panel (2A1A3) set DISTRIBUTION switch (S1) to +24VDC ONLY.	UNIT NO. 1 and INVERTER indicators (DS2 and DS1) go out. At AN/TPM-22 Radar Test Set (UNIT 1), all indicators go out, except 115V 400 CPS.		
38	Measure voltage (dc) between +24VDC + test point (TP3) and +24VDC GRD test point (TP5).	+23.0 to +28.0 Vdc.	Check right-hand battery (2A2A5A1)	Battery Maintenance paragraph 6-27.

Table 6-2. Power Panel 2A1A3, Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
39	Set DISTRIBUTION +24VDC ON/OFF switch (S2) to OFF. At battery and inverter (2A1A5), connect cable (W123P113) to left-hand battery. Disconnect cable connector (W123P118) from right-hand battery.	+24 VDC indicator (DS4) goes out.		
40	Set DISTRIBUTION +24VDC ON/OFF switch (S2) to ON. Measure voltage (dc) between +24VDC + (TP3) and +24VDC GRD (TP5).	+23.0 to +28.0 Vdc.	Check left-hand battery (2A1A5A1)	Battery Maintenance paragraph 6-27.
41	Set DISTRIBUTION +24VDC ON/OFF switch (S2) to OFF. Connect cable (W123P118) to right-hand battery and install access covers.			
42	Set 115V 400CY 1 PHASE ON/OFF switch (S4) to OFF.	115V 400CY 1 PHASE indicator (DS3) goes out. At counter (2A2A3), display goes out.		
43	Make sure that all ON/OFF switches are set to OFF position and that all circuit breakers are set in.			

Table 6-3. Power Panel 2A1A3, Troubleshooting Procedures

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
A	Refer to fig. FO-5 and measure voltage (ac) between 115VAC + (TP6) and GRD (TP7).	108 to 132 Vac.	Check 115V 400CY 1 PHASE indicator (DS3) for open condition.	Perform step B.
B	Refer to fig. FO-3. Disconnect external power connector (W125P27) from shelter power connector and measure voltage (ac) at shelter connector.	108 to 132 Vac.	Check CKT BKR 1 (CB4, 1 amp) and 115V 400CY 1 PHASE ON/OFF switch (S4) for open condition. Check that test set internal cable connector (W120P108) is connected to power panel.	Check power source at input power panel. Refer to TM 9-4940-336-14&P
C	At battery and inverter (2A1A5), and battery and ±15VDC power panel (2A2A5), remove access covers. Disconnect cable connectors (W123P113 and W123P118) from left-hand and right-hand battery connectors (2A1A5A1J2 and 2A2A5A1J2).			
	Refer to fig. FO-3. Measure voltage (dc) between both W123P113 and W123P118 + and - terminals.	Battery charger (2A1A4) charging voltage.	Perform step D.	Check diode CR1 for open condition. Refer to TM 9-6130-300-14 and check out battery charger.

Table 6-3. Power Panel 2A1A3, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
D	At battery and inverter (2A1A5), connect cable connector (W123P113) to left-hand battery connector (2A1A5A1J2).	Battery charger (2A1A4) ammeter indicates a charging current; voltmeter indicates charging voltage.	Refer to Battery Maintenance, paragraph 6-27, and check right-hand battery (2A2A5A1).	Perform step E.
E	At battery and inverter (2A1A5), disconnect cable connector (W123-113) from left-hand battery connector (2A1A5A1J2). Connect cable connector (W123P118) to right-hand battery connector (2A2A5A1J2).	Battery charger (2A1A4) ammeter indicates a charging current; voltmeter indicates charging voltage.	Refer to Battery Maintenance, paragraph 6-27, and check left-hand battery (2A1A5A1).	Refer to Battery Maintenance paragraph 6-33, and check both AN/TSM-100 assemblies (2A1A5A1 and 2A2A5A1).
F	Set 115V 400CY 1 PHASE ON/OFF switch (S4) and DISTRIBUTION +24VDC ON/OFF switch (S2) to OFF. Remove power panel circuit card (2A1A3A1). Set circuit breaker CKT BKR 50 (CB2, 50A) in. Set DISTRIBUTION +24VDC ON/OFF switch (S2) to ON.	CKT BKR 50 (CB2,50A) circuit breaker remains set in.	Perform power panel circuit card (2A1A3A1) test and troubleshooting procedures, table 6-16.	Refer to fig. FO-5 and check K1 relay coil for shorted condition.
G	Refer to fig. FO-5 and measure voltage (dc) between +24VDC TEST POINTS (+) (TP3) and GRD (TP5).	+22.0 to +28.0 Vdc.	Check +24VDC indicator (DS4) for open condition.	Check relay K1, DISTRIBUTION +24 VDC ON/OFF switch (S2) and circuit breaker CKT BKR 50 (CB2) for open condition.

Table 6-3. Power Panel 2A1A3, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
H	Set 115V 400CY 1 PHASE ON/OFF switch (S4) and DISTRIBUTION +24VDC ON/OFF switch (S2) to OFF. Remove power panel circuit card (2A1A3A1). Set circuit breaker CKT BKR 50 (CB2,50A) in. Set DISTRIBUTION +24VDC ON/OFF switch (S2) to ON.	CKT BKR 50 (CB2,50A) circuit breaker remains set in.	Refer to fig. FO-5 and check K3 relay coil for shorted condition. Perform power panel circuit card (2A1A3A1) test and troubleshooting procedures, table 6-16.	Perform steps I and J in sequence.
I	At AN/TPM-22 Radar Test Set (UNIT 1), set power supply (1A1A4) TEST MODE switch to any position but FC CONSOLE.			
J	Set circuit breaker CKT BKR 50 (CB2,50A) in.	CKT BKR 50 (CB2,50A) circuit breaker remains set in.	Refer to fig. FO-4 and check K2 relay coil. for shorted condition. Refer to AN/TPM-22 Radar Test Set (UNIT 1) manual for test procedures.	Refer to fig. FO-5 and check K7 relay coil for shorted condition.
K	Disconnect cable connector (W124P111) from inverter connector (2A1A5A2J1).			
L	Set circuit breaker CKT BKR 10 (CB1,10A) in.	CKT BKR (CB1,10A) circuit breaker remains set in.	Replace inverter (2A1A5A2).	Refer to fig. FO-5 and check INVERTER indicator (DS1) for shorted condition.

Table 6-3. Power Panel 2A1A3, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
M	Refer to fig. FO-5. Measure voltage (dc) between K3 relay contact 3 and GRD test point (TP5) and between K3 relay contact 5 and GRD test point (TP5).	+22.0 to +28.5 Vdc.	Check INVERTER indicator (DS1) for open condition.	Check DISTRIBUTION switch (S1-A1), K3 relay coil and contacts (3 to 5) of CKT BKR 10 (CB1) for open conditions. Perform power panel circuit card (2A1A3A1) checkout, table 6-16.
N	Refer to fig. FO-5. Measure voltage (dc) between +24 VDC test points + (TP3) and GRD (TP5).	+22.0 to +28.0 Vdc.	Check K7 relay coil and contacts for open condition. Perform sight current generator panel (2A1A1) test and troubleshooting procedures, table 6-4.	Check 5AMP CKT BKR (CB3) for open condition.
O	Pull circuit breaker CKT BKR (CB1,10A) out.			
	Refer to fig. FO-3 and measure resistance of inverter load resistors R3, R4 and R5, between terminals of each resistor with connector P107 disconnected.	246 to 275 ohms.	Perform step P.	Replace defective resistor.

Table 6-3. Power Panel 2A1A3, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
P	At left-hand battery and inverter (2A1A5), remove panel assembly access cover. Disconnect cable connector (W124P111) from inverter connector (2A1A5A2J1). Refer to figs. FO-3 and FO-6; measure resistance: FROM — TO W124P111J1 — SCG test panel assembly (2A1A1) Pin C——to——Test point 6 Pin G——to——Test point 7	Less than 2.5 ohms.	Replace inverter (2A1A5A2).	Check K5 relay contacts (3 to 5) for open condition.
Q	Pull circuit breaker CKT BKR 10 (CB1,10A) out.			
R	At battery and inverter (2A1A5) remove panel assembly access cover. Disconnect cable connector (W124P112) from inverter connector (2A1A5A2J2).			

Table 6-3. Power Panel 2A1A3, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
R (cont)	Refer to figs. FO-3 and FO-6; measure resistance: FROM — TO W124P112 — SCG set panel assembly (2A1A1) Pin G—to—Test point 5 Pin H—to—Test point 4 Pin F—to—Test point 3	Less than 2.5 ohms.	Replace inverter (2A1A5A2).	Check K4 relay contacts (D2 to D3 and E2 to E3) for open condition.
S	Pull circuit breaker CKT BKR 10 (CB1,10A) out.			
T	At battery and inverter (2A1A5) remove panel assembly access cover. Disconnect cable connector (W124P112) from inverter connector (2A1A5A2J2). Refer to figs. FO-3 and FO-6; measure resistance: FROM — TO W124P112 — SCG set panel assembly (2A1A1) Pin A—to—Test point 1 Pin B—to—Test point 2	Less than 2.5 ohms.	Replace inverter (2A1A5A2).	Check K4 relay contacts (A2 to A1) for open condition.

Table 6-3. Power Panel 2A1A3, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
U	At AN/TPM-22 Radar Test Set (UNIT 1), remove terminal board cover on right side of console. Refer to fig. FO-4; measure voltage (dc) between TP14-7 (+) and TB14-8 (-).	+4.75 to +5.25 Vdc.	Perform distribution box panel (2A1A2) test and troubleshooting procedures, table 6-6.	Refer to AN/TPM-22 Radar Test Set (UNIT 1) manual for checkout procedures.
V	Set 115V 400CY 1 PHASE ON/OFF switch (S4) and DISTRIBUTION +24VDC ON/OFF switch (S2) to OFF. Remove power panel circuit card (2A1A3A1). Set circuit breaker CKT BKR 50 (CB2,50A) in and set DISTRIBUTION +24VDC ON/OFF switch (S2) to ON.	CKT BKR 50 (CB2,50A) circuit breaker remains set in.	Perform power panel circuit card (2A1A3A1) test and troubleshooting procedures, table 6-16.	Refer to fig. FO-5 and check K9 relay coil for shorted condition.
W	Set 115V 400CY 1 PHASE ON/OFF switch (S4) and DISTRIBUTION +24VDC ON/OFF switch (S2) to OFF. Remove power panel circuit card (2A1A3A1). Set circuit breaker CKT BKR 5 (CB3,5A) in and set DISTRIBUTION +24VDC ON/OFF switch (S2) to ON.	CKT BKR 50 (CB3,5A) circuit breaker remains set in.	Perform power panel circuit card (2A1A3A1) test and troubleshooting procedures, table 6-16.	Refer to fig. FO-5 and check K8 relay coil for shorted condition.

Table 6-3. Power Panel 2A1A3, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
X	Set 115V 400CY 1 PHASE ON/OFF switch (S4) and DISTRIBUTION +24VDC ON/OFF switch (S2) to OFF. Remove power panel circuit card. Set circuit breaker CKT BKR 50 (CB2,50A) in and set DISTRIBUTION +24VDC ON/OFF switch (S2) to ON.	CKT BKR 50 (CB2,50A) circuit breaker remains set in.	Perform power panel circuit card (2A1A3A1) test and troubleshooting procedures, table 6-16.	Refer to fig. FO-5 and check K10 relay coil for shorted condition.
Y	Set 115V 400CY 1 PHASE ON/OFF switch (S4) and DISTRIBUTION +24VDC ON/OFF switch (S2) to OFF. Remove power panel circuit card (2A1A3A1). Set circuit breaker CKT BKR 50 (CB2,50A) in and set DISTRIBUTION +24VDC ON/OFF switch (S2) to ON.	CKT BKR 50 (CB2,50A) circuit breaker remains set in.	Perform power panel circuit card (2A1A3A1) test and troubleshooting procedures, table 6-16.	Refer to fig. FO-5 and check K6 relay coil for shorted condition.
Z	At battery and ±15 Vdc power supply (2A2A5), remove panel assembly access cover. At ±15 Vdc power supply (2A2A5A2), check if +15VDC screwdriver adjusment can be adjusted to obtain normal indication between power panel (2A1A3) +15 VDC test points + (TP8) and GRD (TP10).	+14.25 to +15.75 Vdc.	Set ±15 Vdc power supply (2A2A5A2) +15VDC adjustment for proper indication.	Refer to fig. FO-3. Check K6 relay coil and contacts (3 to 5), and contact DISTRIBUTION switch (S1-A5) for open condition. Perform step AA.

Table 6-3. Power Panel 2A1A3, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
AA	Refer to fig. FO-3. Set 115V 400CY 1 PHASE ON/OFF switch (S4) and DISTRIBUTION +24VDC ON/OFF switch (S2) to OFF. Measure resistance between +15VDC test points + (TP8) and GRD (TP10).	48.0 to 50.5 ohms.	Replace ±15VDC power supply (2A2A5A2).	Refer to fig. FO-5 and check resistor R9 and + OUTPUT ADJUST potentiometer R7 for proper resistance.
AB	At battery and ±15 Vdc power supply (2A2A5), remove panel assembly access cover.			
	At ±15 Vdc power supply (2A2A5A2), check if the -15VDC screwdriver adjustment can be adjusted to obtain normal indication between power panel (2A1A3) -15VDC test points - (TP9) and GRD (TP10).	-14.25 to -15.75 Vdc.	Set ±15 Vdc power supply (2A2A5A2) -15VDC adjustment for proper indication.	Perform step AC.
AC	Refer to fig. FO-3. Set 115V 400CY 1 PHASE ON/OFF switch (S4) and DISTRIBUTION +24VDC ON/OFF switch (S2) to OFF. Measure resistance between -15VDC test points - (TP9) and GRD (TP10).	48.0 to 50.5 ohms.	Replace ± 15 Vdc power supply (2A2A5A2).	Refer to fig. FO-5 and check resistor R8 and - OUTPUT ADJUST potentiometer R6 for proper resistance.

Table 6-3. Power Panel 2A1A3, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
AD	Set 115V 400CY 1 PHASE ON/OFF switch (S4) and DISTRIBUTION +24VDC ON/OFF switch (S2) to OFF. Remove power panel circuit card (2A1A3A1). Set DISTRIBUTION +24VDC ON/OFF switch (S2) to ON.			
AE	At AN/TPM-22 Radar Test Set (UNIT 1) power supply (1A1A4), set CONTROL CKT circuit breaker in.	At AN/TPM-22 Radar Test Set (UNIT 1) power supply (1A1A4) CONTROL CKT circuit breaker remains in.	Perform power panel circuit card (2A1A3A1) test and troubleshooting procedures, table 6-16.	Refer to figs. FO-3 and FO-7. Check K5 relay coil for shorted condition.
AF	At AN/TPM-22 Radar Test Set (UNIT 1) power supply (1A1A4), set TEST MODE switch to any position except PWR SUPL/SERVO or FC CONSOLE.	Unit No.1 indicator (DS2) lights.	Refer to AN/TPM-22 Radar Test Set (UNIT 1) manual for test procedures.	Refer to fig. FO-4. Check DISTRIBUTION switch (S1-B6) for open condition.
AG	Set 115V 400CY 1 PHASE ON/OFF switch (S4) and DISTRIBUTION +24VDC ON/OFF switch (S2) to OFF. Remove power panel circuit card (2A1A3A1) and insert AN/TSM-100 extender board assembly (10554270 or 10554271) into power panel assembly connector A1.			

Table 6-3. Power Panel 2A1A3, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
AG (cont)	Set DISTRIBUTION +24VDC ON/OFF switch (S2) to ON. Refer to figure FO-5. Measure voltage (dc) between extender board assembly (A1-2) test point and GROUND test point (TP11).	+23.0 to +28.0 Vdc.	Perform power panel circuit card (2A1A3A1) test and troubleshooting procedures, table 6-16.	Refer to AN/TPM-22 Radar Test Set (UNIT 1) manual for checkout procedures.
AH	At AN/TPM-22 Radar Test Set (UNIT 1), remove terminal board cover from the right side of vertical console.			
	Refer to fig. FO-3; measure voltage (ac) between TB12-6 (+) and TB12-5 (-).	109 to 121 Vac.	Refer to AN/TPM-22 Radar Test Set (UNIT 1) manual for checkout procedures.	Refer to fig. FO-5. Check K5 relay coil and contacts (1 to 3) for open condition.
AI	Set 115V 400CY 1 PHASE ON/OFF switch (S4) and DISTRIBUTION +24VDC ON/OFF siwtch (S2) to OFF. Remove power panel circuit card (2A1A3A1). Set DISTRIBUTION +24VDC ON/OFF switch (S2) to ON.			
AJ	At AN/TPM-22 Radar Test Set (UNIT 1) power supply (1A1A4), set CONTROL CKT circuit breaker in.	At AN/TPM-22 Radar Test Set (UNIT 1) power supply (1A1A4) CONTROL CKT circuit breaker remains in.	Perform power panel circuit card (2A1A3A1) test and troubleshooting procedures, table 6-16.	Refer to fig. FO-4. Check K4 relay coil for shorted condition. Refer to AN/TPM-22 Radar Test Set (UNIT 1) manual for checkout procedures.

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Table 6-3. Power Panel 2A1A3, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
AK	At AN/TPM-22 Radar Test Set (UNIT 1), remove terminal board cover from the right side of vertical console.			
	Refer to fig. FO-4. Measure voltage (+dc) between TB13-2(+) and TB11-1(-).	+23.0 to +28.0 Vdc.	Refer to fig. FO-4. Check K4 relay coil and contacts for open condition. Refer to AN/TPM-22 Radar Test Set (UNIT 1) manual for test procedures.	Refer to AN/TPM-22 Radar Test Set (UNIT 1) manual for test procedures.

Table 6-4. Sight Current Generator Panel 2A1A1, Test Procedures

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
1	Make sure that all AN/TSM-100 ON/OFF switches are set to OFF position and all circuit breakers are set in.			
2	At power panel (2A1A3) set 115V 400CY 1 PHASE ON/OFF switch (S4) and DISTRIBUTION +24VDC ON/OFF switch (S2) to ON. Set DISTRIBUTION switch to SIGHT CUR GEN position.	Power panel 115V 400CY 1 PHASE +24VDC indicator, INVERTER indicator, and UNIT 1 indicator light.	Perform power panel test, table 6-2.	
3	At AN/TPM-22 Radar Test Set (UNIT 1) power supply (1A1A4), set TEST MODE switch to FC CONSOLE. Depress +24VDC CONTROL switch to ON.			
4	At battery charger (2A1A4), set AC-ON switch to ON.	Battery charger AC indicator lights.	Check battery charger.	Refer to TM 9-6130-300-14.
5		NOTE If operating in extreme cold temperatures, charging voltage may be set to greater than +27.5 Vdc. Refer to table 6-33 for proper upper limit for charging voltage in extreme temperatures.		

Table 6-4. Sight Current Generator Panel 2A1A1, Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
5 (cont)	Make sure that MODE CURRENT ADJUST control is set fully clockwise. Observe VOLTS DC meter and AMPERES DC meter.	Battery charger ammeter indicates a charging current, and voltmeter indicates a charging voltage between +27.0 to +27.5 Vdc.	If VOLTS DC meter indication is greater than upper limit, adjust battery charger MODE VOLTAGE ADJUST control to set charging voltage to its upper limit value.	Tables 6-33 and 6-2.
6	On sight current generator panel (2A1A1), set MODE switch (S11) to GROUND.			
	Set SYSTEM POWER ON/OFF switch (S12) to ON.	SYSTEM POWER indicator (DS12) lights.	If CIRCUIT BREAKER (CB1) opens, perform troubleshooting, table 6-5, step A. If CIRCUIT BREAKER does not open, perform troubleshooting, table 6-5, step B.	
7	Measure voltage (dc) between TEST POINTS 8(+) and 89(-).	+22.0 to +28.0 Vdc.	Perform power panel assembly test, table 6-2.	
8	Measure voltage (dc) between TEST POINTS 1(+) and 2(-).	+17.43 to +19.27 Vdc.	Check K1 relay contacts (A1 to A2) for open condition. Perform power panel assembly test, table 6-2.	Fig. FO-6.

Table 6-4. Sight Current Generator Panel 2A1A1, Test Procedures - Continued

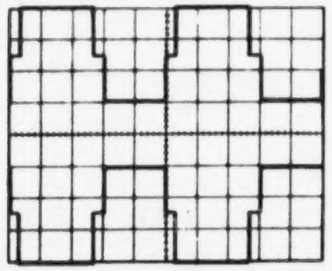
Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
9	Measure voltage (ac) between TEST POINTS 6(+) and 7(-).	108 to 132 Vac.	Check K1 relay contacts (D1 and D2) for open condition. Perform power panel assembly test procedures, table 6-2.	Fig. FO-6.
10	Oscilloscope controls: VOLTS/DIV to 5 VERT MODE to ALT TIME/DIV to .5ms Using X10 probes connect CH1 to TEST POINT 4 and CH2 to TEST POINT 5.	126 to 154 V p-p: 396 to 404 Hz, quasi-square wave. 180° out of phase. 	Check K1 relay contacts (B1 to B2 and C1 to C2) for open condition. Perform power panel assembly test procedures, table 6-2.	Fig. FO-6.
11	Set MODE switch (S11) to RADAR READY.	CIRCUIT BREAKER (CB1) remains in closed (set in) position.	If CIRCUIT BREAK- (CB1) opens, perform troubleshooting procedures, table 6-5, step D.	
	Set RANGE/RANGE RATE switch (S15) to MANUAL.			

Table 6-4. Sight Current Generator Panel 2A1A1, Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
12	Set multimeter FUNCTION switch to VDC and RANGE switch to 100.		Perform troubleshooting procedures, table 6-5, step E.	
	Measure voltage (dc) between TEST POINTS 11(+) and 88(-).	+19.80 to +20.20 Vdc.		
	Set MODE switch to GROUND.	0.0 Vdc.		
	Set RANGE/RANGE RATE switch to AUTO.	+19.80 to +20.20 Vdc.		
13	Measure voltage (dc) between TEST POINTS 12(+) and 88(-).	+9.80 to +10.20 Vdc.	Perform troubleshooting procedures, table 6-5, step F.	
	Set RANGE/RANGE RATE switch to MANUAL	0.0 Vdc.		
	Set MODE switch to RADAR READY.	+9.80 to +10.20 Vdc.		
14	Measure voltage (dc) between TEST POINTS 13(+) and 88(-).	-9.80 to -10.20 Vdc.	Perform troubleshooting procedures, table 6-5, step G.	
	Set MODE switch to GROUND	0.0 Vdc.		
	Set RANGE/RANGE RATE switch to AUTO.	-9.80 to -10.20 Vdc.		
15	Set MODE switch to RADAR READY.			
	Set RANGE/RANGE RATE switch to MANUAL.			
	Measure voltage (dc) between TEST POINTS 21 (+) and 89 (-).	-21.85 to -24.15 Vdc.	Perform troubleshooting procedures, table 6-5, step H.	

Table 6-4. Sight Current Generator Panel 2A1A1, Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
16	Measure voltage (dc) between TEST POINTS 15(+) and 88(-) while rotating RADAR RANGE control through its full range.	Voltage level varies smoothly from 0 to +10 Vdc nominal (at full range).	Check RANGE GREATER THAN 3000M momentary action switch (S8) and RADAR RANGE potentiometer (R7) for proper operation.	Fig. FO-6.
17	Set RADAR RANGE control fully clockwise and RANGE/RANGE RATE switch to AUTO and measure voltage between TP15(+) and TP88 (-).	0.0 Vdc.		
18	Set RANGE/RANGE RATE switch to MANUAL. Measure voltage (dc) between TEST POINTS 15(+) and 89(-) with RANGE GREATER THAN 3000M momentary action switch (S8) depressed.	+14.6 to +16.3 Vdc.	Check RANGE GREATER THAN 3000M momentary action switch (S8) for open connection. Perform sight current generator test panel circuit card assembly (2A1A1A1) test and troubleshooting procedures, table 6-17.	Fig. FO-6.

Table 6-4. Sight Current Generator Panel 2A1A1, Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
19	Set OUTBOUND/INBOUND switch (S14) to OUTBOUND position. Measure voltage (dc) between TEST POINT 14(+) and 88(-) while rotating RADAR RANGE control through its full range.	Voltage level varies smoothly from 0 to +10 Vdc nominal (at full range).	Check OUTBOUND/INBOUND switch (S14) and K3 relay contacts E2 and E3 for open condition.	Fig. FO-6.
20	Set OUTBOUND/INBOUND switch (S14) to INBOUND. Measure voltage (dc) between TEST POINTS 14(+) and 88(-) while rotating RADAR RANGE RATE control through its full range.	Voltage level varies from 0 to -10 Vdc nominal (at full range).	Check OUTBOUND/INBOUND switch (S14) for open condition, and RADAR RANGE potentiometer (R6) for proper operation. Check K3 relay contacts (F2 to F3) for open condition.	Fig. FO-6.
21	Depress LEAD ANGLE GREATER THAN 25° momentary action switch (S5) and measure voltage (dc) between the following: TEST POINTS 19(+) and 89(-) and TEST POINTS 20(+) and 89(-).	-8.27 to -9.57 Vdc.	Check LEAD ANGLE GREATER THAN 25° momentary action switch (S5) for open condition. Perform sight current generator test panel circuit card (2A1A1A1) test and troubleshooting procedures, table 6-17.	Fig. FO-6.

Table 6-4. Sight Current Generator Panel 2A1A1, Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
22	Set RADAR/RANGE RATE control to 0 position. Set SYSTEM POWER ON/OFF switch (S12) to OFF. Using test probe W285, connect TEST POINTS 88 to TEST POINTS 89 and using test probe W286 connect TEST POINTS 14 to TEST POINTS 91. Connect multimeter to monitor voltage (dc) between TEST POINTS 91(+) and GROUND. Set SYSTEM POWER ON/OFF switch (S12) to ON. Set RANGE/RANGE RATE MANUAL/AUTO switch (S15) to MANUAL. Slowly increase voltage level (dc) between TEST POINTS GROUND and 91 by rotating RADAR RANGE RATE control and monitoring the meter until a -1.1 Vdc level is obtained.	SIGHT CAGE indicator (DS11) does not light.	Perform sight current generator circuit card (2A1A1A1) test and troubleshooting procedures, table 6-17.	
23	With same test set up as step 22, continue increasing voltage level (dc) between TEST POINTS 91 and GROUND by rotating RADAR RANGE RATE control and monitoring the meter until a -1.7 Vdc level is obtained.	SIGHT CAGE indicator (DS11) is lit.	Check SIGHT CAGE indicator (DS11) for open condition.	Fig. FO-6.

Table 6-4. Sight Current Generator Panel 2A1A1, Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
23 (cont)		NOTE Indicator can light at any other voltage level between -1.1 and -1.7 Vdc but must be lit at the -1.7 Vdc level for normal indications.	Perform sight current generator circuit card (2A1A1A1) test and troubleshooting procedures, table 6-17.	
24	Set SYSTEM POWER ON/OFF switch (S12) to OFF. Remove all test leads from previous test points. Using test probe W280, connect TEST POINTS 76 to TEST POINTS 8. Using test probe W286, connect TEST POINT 75 to the power panel +24VDC + test point (controlled by the +24VDC ON/OFF switch (S3)).			
	Set SYSTEM POWER ON/OFF switch (S12) to ON.	K27 READY TO FIRE indicator (DS4) does not light.	Perform sight current generator test panel circuit card assembly (2A1A1A1) test and troubleshooting procedures, table 6-17.	

Table 6-4. Sight Current Generator panel 2A1A1, Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
25	Press and hold switch of test probe W280.			
	At power panel set +24 VDC ON/OFF switch to ON for at least 2 seconds and then to OFF.	K27 READY TO FIRE indicator (DS4) lights and remains lit when power panel +24 VDC ON/OFF switch (S3) is set to OFF.	Perform sight current generator circuit card test and troubleshooting procedures, table 6-17.	
	Release test probe W280 switch.	K27 READY TO FIRE indicator goes out.		
26	Set MODE switch (S11) to K26 MANUAL.	K26 MANUAL indicator (DS7) lights.	Check MODE switch (S11-A) and K26 MANUAL indicator.	Fig. FO-6.
27	Set SYSTEM POWER ON/OFF switch to OFF. Remove all test leads. Set COSINE control to 0. At power panel set DISTRIBUTION +24VDC ON/OFF switch (S2) to OFF. Disengage SCG test panel assembly spring-loaded fasteners and slide out until track locks are engaged. NOTE Leave test panel assembly held in extended position for steps 29 to 35. Step 36 contains instructions to return test panel assembly to normal configuration.			

Table 6-4. Sight Current Generator Panel 2A1A1, Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
28	Using test probe W286 and cable assembly W16, connect power panel 15VDC + test point to terminal No. 4 (on back of COSINE control potentiometer (R3)). Using test probe W285 and cable assembly W77, connect power panel 15VDC GRD test point to terminal stud No. 1 (on back of COSINE control potentiometer (R3)).			
	Set power panel DISTRIBUTION switch (S1) to AN/MWM-2.			
	Set DISTRIBUTION +24VDC ON/OFF switch (S2) to ON.			
	At SCG test panel measure voltage (dc) between TEST POINTS 16(+) and 88(-) while rotating COSINE control from 0 to 60.	Voltage level varies smoothly from approximately +15 Vdc to +7.5 Vdc.	Check COSINE potentiometer (R3) for proper adjustment and operation.	Fig. FO-6.
29	Set power panel DISTRIBUTION +24VDC ON/OFF switch (S2) to OFF. Remove all test leads.			
30	Set MANUAL RANGE/METERS control to 500 and MANUAL RANGE RATE/KNOTS control to 0.			
	Using test probe W286 and cable assembly W77 connect power panel 15VDC + test point to J7-U.			

Table 6-4. Sight Current Generator Panel 2A1A1, Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
30 (cont)	Using test probe W285 and cable assembly W16 connect power panel +15 VDC GRD test point to J7-f. Set power panel DISTRIBUTION +24VDC ON/OFF switch (S2) to ON. At SCG test panel measure voltage (dc) between TEST POINTS 9(+) and 88(-) while rotating MANUAL RANGE/METERS control from 500 to 2500.	Voltage level varies smoothly from approximately +2.5 to +12.5 Vdc.	Check MANUAL RANGE/METERS control potentiometer (R2) for proper alignment and operation.	Fig. FO-6.
31	With same test setup as step 30, measure voltage (dc) between TEST POINTS 10(+) and 88(-) while rotating MANUAL RANGE RATE/KNOTS control from 0 to 500.	Voltage level varies smoothly from approximately +7.75 Vdc to +1.25 Vdc.	Check MANUAL RANGE RATE/KNOTS control potentiometer (R4) for proper alignment and operation.	Fig. FO-6.
32	Make sure SYSTEM POWER ON/OFF switch (S12) is OFF. Remove all test leads. Disconnect magnet assembly (A2) connector A2J1 from test panel assembly connector (P1). NOTE Leave magnet assembly (A2) disconnected for steps 33, 34, and 35.			

Table 6-4. Sight Current Generator Panel 2A1A1, Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
32 (cont)	Measure resistance between magnet assembly connector pins A2J1-A (white lead) and A2J1-C (blue lead).	26.0 to 36.0 ohms.	Replace magnet assembly.	
33	Measure resistance between TEST POINTS 87 AND 91.	2.65 to 3.03 ohms.	Check at resistor (R11) for normal indication.	Fig. FO-6.
34	Measure resistance between TEST POINTS 87(-) to front panel connector pin J6-A (+) and then reverse meter leads and measure from J6-A(-) to TEST POINTS 87(+).	Resistance measured from TEST POINT 87 (+) to J6-A(-) at least 10 times as large as resistance measured from J6-A(+) to TEST POINT 87(-).	Check at diode (CR4) for normal indication.	Fig. FO-6.
35	Remove all test leads. Remove sight current generator circuit card assembly (2A1A1 A1) and check resistance between pin 26(-) and pin 22(+) and between pin 26 (-) and 21(+). Reverse test leads for both tests and note resistance.	Resistance measured when test leads are reversed must be at least 10 times greater than the initial measurements.	Check directly at diodes (CR3 and CR8) for normal indication. If normal indication can not be obtained, replace defective diode(s).	Table 6-17.
36	Remove all test leads and replace circuit card. Connect magnet assembly connector A2J1 to test panel assembly connector (P1). Release test panel assembly track locks, slide test panel assembly in and secure.			

Table 6-4. Sight Current Generator Panel 2A1A1, Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
36 (cont)	Measure resistance between TEST POINTS 92 and front panel connector pin J6-T.	31.5 to 42.5 ohms.	Check at torque motor assembly (A3) for normal indication.	Fig. FO-6.
37	Measure resistance between TEST POINTS 92 and front panel connector pin J6-B.	1.9 to 2.5 ohms.	Perform sight current generator circuit card (2A1A1A1) test and troubleshooting procedures, table 6-17.	
38	Remove all test leads. Connect cable W288 between power panel and SCG panel as follows: P1 to J4 of SCG panel. +13 to + OUTPUT ADJUST jack on power panel. -13 to - OUTPUT ADJUST jack. +15 to +15VDC + jack. -15 to -15VDC - jack. GND to +15VDC GRD jack.			
39	At power panel set 115V 400CY 1 PHASE ON/OFF switch (S4) and DISTRIBUTION +24VDC ON/OFF switch (S2) to ON. Set DISTRIBUTION switch (S1) to AN/MWM-2 position.			

Table 6-4. Sight Current Generator Panel 2A1A1, Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
40	At power panel connect multimeter to + OUTPUT TO AN/MWM-2 jack and GROUND jack. Adjust + OUTPUT ADJUST control for normal indication.	+12.999 to +13.001 Vdc.	Perform power panel test procedures, table 6-2.	
41	At power panel connect multimeter to - OUTPUT TO AN/MWM-2 jack and GROUND jack. Adust - OUTPUT ADJUST control for normal indication.	-12.999 to -13.001 Vdc.	Perform power panel test procedures, table 6-2.	
42	Connect multimeter to TEST POINTS 20(+) and 88(-).		**CAUTION** To prevent damage to potentiometers do not measure resistance of LEAD ANGLE TRAVERSE (R1), COSINE (R3), or cups of LEAD ANGLE EL (R5) potentiometers.	
	Set LEAD ANGLE TRAVERSE potentiometer to 0.	0.0 to -0.12 Vdc.	Check sight current generator panel wiring.	
	Set LEAD ANGLE TRAVERSE potentiometer to 15.	-5.14 to -5.66 Vdc.	Replace LEAD ANGLE TRAVERSE potentiometer (R1).	
	Set LEAD ANGLE TRAVERSE potentiometer to -15.	-5.14 to -5.66 Vdc.		

Table 6-4. Sight Current Generator Panel 2A1A1, Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
43	Connect multimeter to TEST POINTS 19(+) and 88(-).		Check sight current generator panel wiring. Replace LEAD ANGLE EL potentiometer (R5).	Fig. FO-6.
	Set LEAD ANGLE EL potentiometer to 0.	0.0 to -0.12 Vdc.		
	Set LEAD ANGLE EL potentiometer to 15.	-5.14 to -5.66 Vdc.		
	Set LEAD ANGLE EL potentiometer to -15.	-5.14 to -5.66 Vdc.		
44	Connect multimeter to TEST POINTS 18(+) and 88(-).		Check sight current generator panel wiring. Replace LEAD ANGLE EL potentiometer (R5).	Fig. FO-6.
	Set LEAD ANGLE EL potentiometer to 0.	+0.065 to -0.065 Vdc.		
	Set LEAD ANGLE EL potentiometer to 15.	+7.65 to +7.95 Vdc.		
	Set LEAD ANGLE EL potentiometer to -15.	-7.65 to -7.95 Vdc.		
45	Connect multimeter lead to TEST POINTS 17(+) and 88(-).		Check sight current generator panel wiring. Replace LEAD ANGLE EL potentiometer (R5).	Fig. FO-6.
	Set LEAD ANGLE EL potentiometer to 0.	+0.1 to -0.1 Vdc.		
	Set LEAD ANGEL EL potentiometer to 15.	+2.60 to +3.02 Vdc.		
	Set LEAD ANGLE EL potentiometer to -15.	-2.60 to +3.02 Vdc.		
46	At power panel set DISTRIBUTION +24VDC and 115V 400CY 1 PHASE switches to OFF.	+24VDC and 115V 400CY 1 PHASE indicators extinguish. At battery charger (2A1A4) AC indicator extinguishes.		

Table 6-4. Sight Current Generator Panel 2A1A1, Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
47	Set MODE switch (S11) to RADAR READY.		Check ACTION switch (S9-C1) for open condition.	Fig. FO-6.
	Measure resistance between TEST POINTS 8 and connector J7-A.			
	Set ACTION switch (S9) to OFF.	Greater than 500k ohms.		
	Set ACTION switch to ON.	Less than 2.5 ohms.		
48	Measure resistance between TEST POINTS 8 and connector pin J7-k.		Check MODE switch (S11-C2) for open condition and ACTION switch for open condition.	Fig. FO-6.
	Set ACTION switch (S9) to OFF.	Greater than 500k ohms.		
	Set ACTION switch to ON.	Less than 2.5 ohms.		
49	Measure resistance between connector pin J3-A and J3-B.		Check FOOTSWITCH (S13) for open condition.	Fig. FO-6.
	Set FOOTSWITCH (S13) to OFF.	Greater than 500k ohms.		
	Set FOOTSWITCH to ON.	Less than 2.5 ohms.		
50	Measure resistance between connector pins J2-B and J2-C.		Check LOCK ON switch for open condition.	Fig. FO-6.
	Set LOCK ON switch to OFF.	Less than 2.5 ohms.		
	Set LOCK ON switch to ON.	Greater than 500k ohms.		
51	Measure resistance between connector pins J2-P and J2-R.	Greater than 500k ohms.	Check ECM switch (S4) for open condition.	Fig. FO-6.
	Press and hold ECM switch (S4).	Less than 2.5 ohms.		

Table 6-4. Sight Current Generator Panel 2A1A1, Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
52	Measure resistance between connector pins J7-c and J7-s. Press and hold SIGHT CAGE BUTTON.	Greater than 500k ohms. Less than 2.5 ohms.	Check SIGHT CAGE BUTTON switch (S10) for open condition.	Fig. FO-6.
53	Measure resistance between connector pin J7-g and TEST POINTS 89. Press and hold EXTERNAL READY TO FIRE switch.	Greater than 500k ohms. Less than 2.5 ohms.	Check EXTERNAL READY TO FIRE switch (S6) for open condition.	Fig. FO-6.
54	Measure resistance between connector pin J7-K and TEST POINTS 89. Press and hold ELEVATION GREATER THAN 80° switch.	Less than 2.5 ohms. Greater than 500k ohms.	Check ELEVATION GREATER THAN 80° switch (S7) for open condition.	Fig. FO-6.
55	Measure resistance between connector pins J2-Y and J2-U.	25 to 100 ohms.	Check ANTENNA SERVO COMMAND indicator (DS5) for open condition.	Fig. FO-6.
56	Measure resistance between connector pins J7-h and and J7-j.	25 to 100 ohms.	Check K25 EXTERNAL indicator (DS8) for open condition.	Fig. FO-6.
57	Measure resistance between connector pins J7-V and J7-W.	25 to 100 ohms.	Check TEST indicator (DS9) for open condition.	Fig. FO-6.
58	Measure resistance between connector pins J6-L and J6-N.	25 to 100 ohms.	Check READY TO FIRE indicator (DS1) for open condition.	Fig. FO-6.

Table 6-4. Sight Current Generator Panel 2A1A1, Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
59	Measure resistance between connector pin J7-p and ground TEST POINTS 89.	25 to 100 ohms.	Check K23 10 SEC TD indicator (DS2) for open condition.	Fig. FO-6.
60	Measure resistance between connector pin J7-X and ground TEST POINTS 89.	25 to 100 ohms.	Check RADAR READY indicator (DS6) for open condition.	Fig. FO-6.
61	Measure resistance between connector pin J2-Z and ground TEST POINTS 89.	25 to 100 ohms.	Check RADIATE COMMAND indicator (DS10) for open condition.	Fig. FO-6.
62	Measure resistance between connector pin J7-E ground TEST POINTS 89.	25 to 100 ohms.	Check K26 MANUAL indicator DS7.	Fig. FO-6.
63	Measure resistance between TEST POINTS 8 and the following connector pins. Make each measurement with MODE switch (S11) set to RADAR READY and then to GROUND. J7-r, J7b	Under 2.5 ohms with MODE switch (S11) set to RADAR READY. Over 500k ohms with MODE switch (S11) set to GROUND.	Check MODE switch contacts (S11-B2) and (S11-D2) for open condition.	Fig. FO-6.
64	Remove K26 MANUAL indicator (DS7) from panel and measure resistance between TEST POINTS 8 and the following connector pins. Make each measurement with MODE switch (S11) set to K26 MANUAL and then to GROUND.	Under 2.5 ohms with MODE switch (S11) set to K26 MANUAL.	Check MODE switch (S11-A3, S11-B3, S11-C3, and S11-D3) for open condition.	Fig. FO-6.

Table 6-4. Sight Current Generator Panel 2A1A1, Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
64 (cont)	J7-E J7-r J-7-a	Over 500k ohms with MODE switch (S11) to GROUND.		
	J7-e	Under 2.5 ohms with MODE switch (S11) set to K26 MANUAL, over 200 ohms with MODE switch (S11) set to GROUND.		
65	Reinstall K26 MANUAL indicator (DS7) in front panel. Set MODE switch (S11) to K25 EXTERNAL.	Under 2.5 ohms with MODE switch (S11) set to K25 EXTERNAL.	Check MODE switch (S11-B4 and S11-C4) for open condition.	Fig. FO-6.
	Measure resistance between TEST POINTS 8 and the following connector pins. Make each measurement with MODE switch (S11) set to K25 EXTERNAL and then to GROUND.			
	J7-r J7-m	Over 500k ohms with MODE switch (S11) set to GROUND.		
66	Set MODE switch (S11) to TEST.		Check MODE switch contacts (S11-A5, S11-B5, S11-C5 and S11-D5) for open condition.	Fig. FO-6.
	Measure resistance between TEST POINTS 8 and the following connector pins. Make each measurement with MODE switch (S11) set to TEST and then to GROUND.			

Table 6-4. Sight Current Generator Panel 2A1A1, Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
66 (cont)	J7-d, J7-r, J7-b	Under 2.5 ohms with MODE switch (S11) set to TEST. Over 500k ohms with MODE switch (S11) set to GROUND.		
	J7-e	Under 2.5 ohms with MODE switch (S11) set to TEST, over 200 ohms with MODE switch (S11) set to GROUND.		

Table 6-5. Sight Current Generator Panel 2A1A1, Troubleshooting Procedures

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
A	Remove sight current generator circuit card (2A1A1A1). Set CIRCUIT BREAKER (CB1) in.	CIRCUIT BREAKER (CB1) remains in.	Perform sight current generator circuit card test and troubleshooting procedures, table 6-17.	Refer to fig. FO-6 and check K1 relay coil for shorted condition.
B	Refer to fig. FO-6. Measure voltage (dc) between TEST POINTS 8 and ground TEST POINTS 89.	+22.0 to +28.0 Vdc.	Check SYSTEM POWER indicator (DS12) and K1 relay coil and contacts (E1 to E2) for open condition.	Perform step C.
C	Refer to fig. FO-6. Measure voltage (dc) between CIRCUIT BREAKER (CB1) LINE terminal and ground TEST POINTS 89.	+22.0 to +28.0 Vdc.	Check CIRCUIT BREAKER (CB1) and SYSTEM POWER switch (S12) for open condition.	Perform power panel (2A1A3) test, table 6-2.
D	Remove sight current generator circuit card. Set CIRCUIT BREAKER (CB1) in.	CIRCUIT BREAKER (CB1) remains in.	Perform sight current generator circuit card test and troubleshooting procedures, table 6-17.	Refer to fig. FO-6 and check K2 relay coil for shorted condition.

Table 6-5. Sight Current Generator Panel 2A1A1, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
E	At AN/TPM-22 Radar Test Set (UNIT 1), remove terminal board cover from the right side of vertical console.			
	Refer to fig. FO-4. Measure voltage (dc) between TB14-3(+) and TB14-4(-).	+19.80 to +20.20 Vdc.	Refer to fig. FO-6 and check K2 relay coil and contacts (A1 to A2) for open condition. Check K3 relay coil contacts (D3 to D2 and D2 to D1) for open condition. Check switch S15.	Refer to AN/TPM-22 Radar Test Set (UNIT 1) manual for test procedure PP-6324.
F	At AN/TPM-22 Radar Test Set (UNIT 1), remove terminal board cover from the right side of vertical console.			
	Refer to fig. FO-4. Measure voltage (dc) between TB14-1(+) and TB14-4(-).	+9.80 to +10.20 Vdc.	Refer to fig. FO-6 and check K2 relay contacts (B1 to B2) for open condition. Check relay K3 contacts (C3 to C2 and C2 to C1) for open contacts. Check switch S15.	Refer to AN/TPM-22 Radar Test Set (UNIT 1) manual for test procedure PP-6324.

Table 6-5. Sight Current Generator Panel 2A1A1, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
G	At AN/TPM-22 Radar Test Set (UNIT 1), remove terminal board cover from right side of vertical console.			
	Refer to fig. FO-4. Measure voltage (dc) between TB14-2(+) and TB14-4(-).	-9.80 to -10.20 Vdc.	Refer to fig. FO-6 and check K2 relay contacts (C1, C2) for open condition. Check relay K3 contacts (B3 to B2 and B2 to B1) for open contacts. Check switch S15.	Refer to AN/TPM-22 Radar Test Set (UNIT 1) manual for test procedure PP-6324.
H	At AN/TPM-22 Radar Test Set (UNIT 1), remove terminal board cover from right side of vertical console.			
	Refer to fig. FO-4. Measure voltage (dc) between TB14-5(+) and TB14-6(-).	-21.85 to -24.15 Vdc.	Refer to fig. FO-6 and check K2 relay contacts (D1 to D2) for open condition.	Refer to AN/TPM-22 Radar Test Set (UNIT 1) manual for test procedure PP-6324.

Table 6-6. Distribution Box Panel 2A1A2. Test Procedures

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
1	Make sure all AN/TSM-100 ON/OFF switches are set to OFF position and all circuit breakers are set in.			
2	At power panel (2A1A3), set 115V 400CY 1 PHASE ON/OFF switch and DISTRIBUTION +24 VDC ON/OFF switch to ON. Set DISTRIBUTION switch to DB.	At power panel, 115V 400CY 1 PHASE indicator and +24 VDC indicator lights.	Perform power panel test procedures, table 6-2.	
3	At AN/TPM-22 Radar Test Set (UNIT 1) power supply (1A1A4), set TEST MODE switch to FC CONSOLE. Depress +24 VDC pushbutton indicator to illuminate ON legend.	UNIT No. 1 indicator lights.		
4	At battery charger (2A1A4), set AC-ON switch to ON. Make sure that MODE CURRENT ADJUST control is set fully clockwise. Observe VOLTS DC meter and AMPERES DC meter.	At battery charger, AC indicator lights, ammeter indicates a charging current, voltmeter indicates a charging voltage between +27.0 to +27.5 Vdc.	If VOLTS DC meter indication is greater than upper limit, adjust battery charger MODE VOLTAGE ADJUST control to its upper limit value.	
			Perform power panel troubleshooting procedures in table 6-3, step C.	Fig. FO-5, fig. FO-3 battery charger manual (see appendix A).

Table 6-6. Distribution Box Panel 2A1A2. Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
4(cont)		NOTE If operating in extreme cold temperatures, charging voltage may be set to greater than +27.5 Vdc. Refer to table 6-33 for proper upper limit for charging voltage in extreme cold temperatures.		
5	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to ON.	+5 VDC indicator (DS23) lights.	Refer to fig. FO-7 sheet 1, and check 0.5 AMP fuse (F1) for open condition. If fuse is open perform distribution box circuit card assemblies (2A1A2A1, 2A1A2A3, 2A1A2A4, 2A1A2A5, and 2A1A2A6) test and troubleshooting procedures, tables 6-18, 6-20, 6-21, 6-22, 6-23. Refer to fig. FO-7 sheet 1, and check +5 VDC indicator (DS23) for open condition.	Fig. FO-7, sheet 1.

Table 6-6. Distribution Box Panel 2A1A2. Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
5(cont)			Perform troubleshooting procedures, table 6-7 steps A, B, C, and D in sequence.	
6	Set TEST SYSTEM POWER +24 VDC switch (S16) to ON.	+24 VDC indicator (DS24) lights.	Refer to fig. FO-7 and check +24 VDC indicator (DS24), 5 amp circuit breaker (CB1), and TEST SYSTEM POWER +5 VDC and +24 VDC switches (S15 and S16) for open condition.	Fig. FO-3 and fig. FO-7, sheet 1.
	NOTE If desired, when making voltage or resistance measurements at INPUT A (J18) or INPUT B (J19) coaxial connectors during the following procedures, the binding post adapter can be used to adapt either connector to a test point connection.			
7	Set both RELAY TIME SELECTORS CHANNEL A and CHANNEL B switches (S17 and S18) to K5, and measure	+22.0 to +28.0 Vdc.	Perform troubleshooting procedure, table 6-7, step F.	Fig. FO-7, sheet 6; and fig. FO-3.

Table 6-6. Distribution Box Panel 2A1A2. Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
7(cont)	voltage (dc) between INPUT A coaxial connector (J18) and GRD test point (TP3), and between INPUT B coaxial connector (J19) and GRD test point (TP3).			
8	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to OFF. Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to OFF. Disengage panel and slide out until track locks are engaged. NOTE Leave test panel held in extended position to end of checkout/fault isolation procedures. When procedures are completed, disengage track locks, slide assembly back into test set, and fasten with spring-loaded fasteners. Remove relay time circuit card (2A1A2A7) and insert AN/TSM-100 extender board assembly (10554270 or (10554271) into distribution box panel connector (A7).	+5 VDC and +24 VDC indicators (DS23 and DS-24) go out.	Check +5 VDC switch (S15) or +24 VDC switch (S16) for shorted conditions.	Fig. FO-3 and FO-7, sheet 1.

Table 6-6. Distribution Box Panel 2A1A2. Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
8(cont)	Insert relay time circuit card 2A1A2A7) into connector on top of extender board assembly. NOTE Leave circuit card inserted in extender board for steps 9 to 72. Step 73 contains instructions to remove extender board assembly and insert circuit card back into its distribution box connector. Set RELAY TIME SELECTORS CHANNEL A to K9 and set RELAY TIME SELECTORS CHANNEL B to K10. With test probe W286 connect TEST POINTS 6 to power panel (2A1A3) +24 VDC + test point (controlled by the +24 VDC test point control ON/OFF switch). NOTE Leave W286 connected in place for steps 9 to 35. Step 36 contains instructions to remove the W286 connection.			

Table 6-6. Distribution Box Panel 2A1A2. Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
8(cont)	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to ON. Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to ON.	+5 VDC indicator (DS23) and +24 VDC indicator (DS24) light. K5 indicator (DS1) does not light.	Perform relay time circuit card (2A1A2A7) test and troubleshooting procedures test, table 6-24.	Fig. FO-20, fig. FO-7, sheets 6 and 7.
9	At power panel set +24 VDC ON/OFF switch to ON.	K5 indicator (DS1) lights.	Perform troubleshooting procedure, table 6-7, steps H and I in sequence.	Fig. FO-3, fig. FO-7, sheets 6 and 7.
10	Measure voltage (dc) between extender board assembly A7-2 (+) and A7-1 (-) test points.	Less than 2 Vdc.	Perform relay time circuit card test and troubleshooting procedures test, table 6-24.	Fig. FO-7, sheet 6, fig. FO-20.
11	At power panel set +24 VDC ON/OFF switch to OFF.	K5 indicator (DS1) goes out.		
12	Set both RELAY TIME SELECTORS CHANNEL A and CHANNEL B switches (S17 and S18) to K8, and measure voltage (dc) between INPUT A coaxial connector (J18) and GRD test point (TP3), and between INPUT B coaxial connector (J19) and GRD test point (TP3).	+22.0 to +28.0 Vdc.	Perform troubleshooting procedure, table 6-7, step J.	Fig. FO-7, sheet 6.
13	Set RELAY TIME SELECTORS CHANNEL A to K11 and set	K8 indicator (DS7) does not light.	Perform troubleshooting proce-	Fig. FO-7, sheets 4 and 7.

Table 6-6. Distribution Box Panel 2A1A2. Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
13(cont)	CHANNEL B to K7. Set RATE switch (S8) to HI.		dure, table 6-7, step K.	
14	At power panel set +24 VDC ON/OFF switch to ON, for at least two seconds, and then to OFF.	K8 indicator (DS7) lights while power panel +24 VDC test point control switch is set to ON and goes out when switch is set to OFF.	Refer to fig. FO-7, sheet 4, and measure voltage at A5-27 for 0 Vdc. Check DS7 and associated wiring. Perform troubleshooting procedures, table 6-7, step L.	Fig. FO-7, sheet 4.
15	Set RATE switch (S8) to LO. Depress and release RESET pushbutton switch (S19).	K8 indicator (DS7) may light and go out when RESET pushbutton switch (S19) is depressed and released.	Perform K8 operation and sequence circuit card test and troubleshooting procedures test, table 6-22.	Fig. FO-18, fig. FO-7, sheet 4.
16	At power panel set +24 VDC ON/OFF switch to ON, for at least two seconds, and then to OFF.	K8 indicator (DS7) does not light while power panel +24 VDC test point control switch is set to ON but does light when switch is set to OFF.	Perform troubleshooting procedures, table 6-7, steps R and S in sequence.	Fig. FO-7, sheets 1 and 4.
17	At power panel set +24 VDC ON/OFF switch to ON.	K8 indicator (DS7) goes out.	Perform K8 operation and sequence circuit card test and troubleshooting procedures, table 6-22.	Fig. FO-18, fig. FO-7, sheet 4.

Table 6-6. Distribution Box Panel 2A1A2. Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
18	Measure voltage (dc) between extender board assembly A7-8 (+) and A7(-) test point.	Less than +2 Vdc.	Perform relay time circuit card (2A1A2A7) test and troubleshooting procedures, table 6-24.	Fig. FO-20, fig. FO-7, sheet 6.
19	At power panel set +24 VDC ON/OFF switch to OFF.	K8 indicator (DS7) lights.	Perform K8 operation and sequence circuit card test and troubleshooting procedures, table 6-22.	Fig. FO-7, sheet 4, fig. FO-18.
20	Depress and release RESET pushbutton switch (S19).	K8 indicator (DS7) goes out and then lights.	Perform troubleshooting procedure, table 6-7, step V.	Fig. FO-7, sheets 1 and 4.
21	Set both RELAY TIME SELECTORS CHANNEL A and CHANNEL B switches (S17 and S18) to K10, and measure voltage (dc) between INPUT A coaxial connector (J18) and GRD test point (TP3), and between INPUT B coaxial connector (J19) and GRD test point (TP3).	+22.0 to +28.0 Vdc.	Perform troubleshooting procedure, table 6-7, step W.	Fig. FO-7, sheet 6.
22	Set RELAY TIME SELECTORS CHANNEL A switch (S17) to K9, and set CHANNEL B switch (S18) to K7.	K10 indicator (DS9) does not light.	Perform relay time circuit card test and troubleshooting procedures, table 6-24.	Fig. FO-20, fig. FO-7, sheets 6 and 7.

Table 6-6. Distribution Box Panel 2A1A2. Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
23	At power panel set +24 VDC ON/OFF switch to ON.	K10 indicator (DS9) lights.	Perform fault isolation procedures, table 6-7, steps X and Y in sequence.	Fig. FO-7, sheets 2 and 7.
24	Measure voltage (dc) between extender board assembly A7-5 (+) and A7-1 (-) test points.	Less than +2.0 Vdc.	Perform relay time circuit card test and troubleshooting procedures, table 6-24.	Fig. FO-20, fig. FO-7, sheet 6.
25	At power panel set +24 VDC ON/OFF switch to OFF.	K10 indicator (DS9) goes out.		
26	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to OFF. Set TEST SYSTEM POWER +24VDC ON/OFF switch (S16) to OFF. Remove relay sense resistors circuit card (2A1A2A2) NOTE Leave circuit card removed for steps 27 to 73. Step 74 contains instructions to insert the circuit card back into its distribution box panel connector.	+5 VDC and +24 VDC indicators (DS23 and DS24) go out.	Check +5 VDC switch (S15) and +24 VDC switch (S16) for shorted condition.	Fig. FO-3 and FO-7, sheet 1.

Table 6-6. Distribution Box Panel 2A1A2. Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
26(cont)	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to ON.			
	Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to ON.			
	Set both RELAY TIME SELECTORS CHANNEL A and CHANNEL B switches (S17 and S18) to K11, and measure voltage (dc) between INPUT A coaxial connector (J18) and GRD test point (TP3) and between INPUT B coaxial connector (J19) and GRD test point (TP3).	+22.0 to +28.0 Vdc.	Perform troubleshooting procedure, table 6-7, step Z.	Fig. FO-7, sheet 6.
27	Set RELAY TIME SELECTORS CHANNEL A switch (S17) to OFF, and set RELAY TIME SELECTORS CHANNEL B switch (S18) to K5.			
28	At power panel set +24 VDC ON/OFF switch to ON.			
29	Measure voltage (dc) between extender board assembly A7-15 (+) and A7-1 (-) test points.	Less than +2.0 Vdc.	Perform troubleshooting procedure, table 6-7, step AA.	Fig. FO-7, sheet 6.
30	At power panel set +24 VDC ON/OFF switch to OFF.			

Table 6-6. Distribution Box Panel 2A1A2. Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
31	Set both RELAY TIME SELECTORS CHANNEL A and CHANNEL B switches (S17 and S18) to BRAKE, and measure voltage (dc) between INPUT A coaxial connector (J18) and GRD test point (TP3), and between INPUT B coaxial connector (J19) and GRD test point (TP3).	+22.0 to +28.0 Vdc.	Perform troubleshooting procedure, table 6-7, step AB.	Fig. FO-3, fig. FO-7, sheets 6 and 7.
32	At power panel set +24 VDC ON/OFF switch to ON.	BRAKE indicator (DS12) lights.	Perform troubleshooting procedures, table 6-7, steps AC and AD in sequence.	Fig. FO-3, fig. FO-7, sheets 6 and 7.
33	Measure voltage (dc) between extender board assembly A7-11 (+) and A7-1 (-) test points.	Less than +2.0 Vdc.	Perform relay time circuit card test and troubleshooting procedures, table 6-24.	Fig. FO-20, fig. FO-7, sheets 6 and 7.
34	At power panel set +24 VDC ON/OFF switch to OFF.	BRAKE indicator (DS12) goes out.	Perform relay time circuit card test and troubleshooting procedures, table 6-24.	Fig. FO-20, fig. FO-7, sheet 6.
35	Measure resistance between 3.9K TEST POINTS (TP10 and TP11).	3.70K to 4.09K ohms.	Refer to fig. FO-7, sheet 1 and check resistor R2 for open or shorted condition.	Fig. FO-7, sheet 1.

Table 6-6. Distribution Box Panel 2A1A2. Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
36	Set RELAY TIME SELECTOR CHANNEL A switch (S17) to OFF and set CHANNEL B switch to K11. CAUTION Failure to perform the following step will result in damage to the equipment. Remove test probe W286 from TEST POINTS 6 and connect to TEST POINTS 11. Connect test probe W285 between TEST POINTS 6 and 10.	K14 indicator (DS18) does not light.	Perform relay time circuit card test and troubleshooting procedure, table 6-24.	Fig. FO-20, fig. FO-7, sheets 6 and 7.
37	At power panel set +24 VDC ON/OFF switch to ON.	K14 indicator (DS18) does not light.	Refer to fig. FO-7, sheet 6, and check ACQ TIME switch (S11-C2) for shorted condition.	Fig. FO-7, sheet 6.
38	Set ACQ TIME ON/OFF switch (S11) to ON.	K14 indicator (DS18) lights.	Refer to fig. FO-7, sheet 6. Check A7-22 for 0.0 Vdc. Check DS18 and associated wiring. Perform troubleshooting procedure, table 6-7, step AE.	

Table 6-6. Distribution Box Panel 2A1A2. Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
39	Set ACQ TIME ON/OFF switch (S11) to OFF At power panel set +24 VDC ON/OFF switch to OFF.	K14 indicator (DS18) goes out.		
40	Remove test probe W285 from TEST POINTS 6 and connect to TEST POINTS 7.	K13 indicator (DS20) does not light.	Perform relay time circuit card test and troubleshooting procedures, table 6-24A.	Fig. FO-7, sheet 6; fig. FO-20.
41	At power panel set +24 VDC ON/OFF switch to ON.	K13 indicator (DS20) does not light.	Refer to fig. FO-7, sheet 6, and check EL LIMIT switch (S12-C2) for shorted condition.	Fig. FO-7, sheet 6.
42	Set EL LIMIT ON/OFF switch (S12) to ON.	K13 indicator (DS20) lights.	Refer to fig. FO-7, sheet 6. Check A7-20 for 0.0 Vdc. Check DS20 and associated wiring. Perform troubleshooting procedure, table 6-7, step AF.	
43	Set EL LIMIT ON/OFF switch (S12) to OFF. At power panel set +24 VDC ON/OFF switch to OFF.	K13 indicator (DS20) goes out.		

Table 6-6. Distribution Box Panel 2A1A2. Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
44	Remove test probe W285 from TEST POINTS 7 and connect to TEST POINTS 8. NOTE Leave connection in place for steps 44 through 50. Step 51 contains instructions to remove the connection.			
	Set RELAY TIME SELECTOR CHANNEL B switch (S18) to K5.	K16 indicator (DS21) does not light.	Perform relay time circuit card test and troubleshooting procedures, table 6-24.	Fig. FO-7, sheet 6, fig. FO-20.
45	At power panel set +24 VDC ON/OFF switch to ON.	K16 indicator (DS21) does not light.	Refer to fig. FO-7, sheet 6, and check LEFT LIMIT switch (S14-C2) for shorted conditions.	Fig. FO-7, sheet 6.
46	Set LEFT LIMIT switch (S14) to ON.	K16 indicator (DS21) lights.	Refer to fig. FO-7, sheet 6. Check A7-18 for 0.0 Vdc. Check DS21 and associated wiring. Perform troubleshooting procedure, table 6-7, step AG.	

Table 6-6. Distribution Box Panel 2A1A2. Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
47	Set RELAY TIME SELECTOR CHANNEL B switch (S18) to K6 and LEFT LIMIT switch (S14) to OFF.	K16 indicator (DS21) goes out and K15 indicator (DS22) does not light.	Refer to fig. FO-7 sheet 6, and check RIGHT LIMIT switch (S13-C2) for shorted condition. Perform relay time circuit card test and troubleshooting procedures, table 6-24.	Fig. FO-7, sheet 6.
48	Set RIGHT LIMIT ON/OFF switch (S13) to ON.	K15 indicator (DS22) lights.	Refer to fig. FO-7, sheet 6. Check A7-16 for 0.0 Vdc. Check DS22 and associated wiring. Perform troubleshooting procedure, table 6-7, step AH.	
49	Set RIGHT LIMIT ON/OFF switch (S13) to OFF. At power panel set +24 VDC ON/OFF switch to OFF.	K15 indicator (DS22) goes out.		
50	Set RELAY TIME SELECTORS CHANNEL A switch (S17) to K5. Set RELAY TIME SELECTORS CHANNEL B Switch (S18) to K11.			

Table 6-6. Distribution Box Panel 2A1A2. Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
51	Remove test probe W285 from TEST POINTS 8 and 10. Remove test probe W286 from TEST POINTS 11 and connect to TEST POINTS 6. At power panel set +24 VDC ON/OFF switch to ON.	K2 indicator (DS3) lights.	Refer to fig. FO-7, sheet 1, and check K2 indicator (DS3) for open condition. Refer to fig. FO-7, sheet 7, and CHECK RELAY TIME SELECTOR CHANNEL A switch (S17-H1) for open condition.	Fig. FO-7, sheets 1 and 7.
52	At power panel set +24 VDC ON/OFF switch to OFF	K2 indicator (DS3) goes out.		
53	Set RELAY TIME SELECTORS CHANNEL A switch (S17) to K10, and set CHANNEL B switch (S18) to K5.			
54	At power panel set +24 VDC ON/OFF switch to ON.	K17 indicator (DS19) lights.	Refer to fig. FO-7, sheet 2, and check K17 indicator (DS19) for open condition. Refer to fig. FO-7, sheet 7, and check RELAY TIME SELECTOR CHANNEL A switch (S17-B6) for open condition.	Fig. FO-7, sheets 2 and 7.

Table 6-6. Distribution Box Panel 2A1A2. Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
55	At power panel set +24 VDC ON/OFF switch to OFF.	K17 indicator (DS19) goes out.		
56	Set RELAY TIME SELECTORS CHANNEL A switch (S17) to K12, and set CHANNEL B switch (S18) to K7.			
57	At power panel set +24 VDC ON/OFF switch to ON.	K1 indicator (DS17) lights.	Refer to fig. FO-7, sheet 2, and check K1 indicator (DS17) for open condition. Refer to fig. FO-7, sheet 7 and check RELAY SELECTOR CHANNEL A switch S17-D8) for open condition.	Fig. FO-7, sheets 2 and 7.
58	At power panel set +24 VDC ON/OFF switch to OFF.	K1 indicator (DS17) goes out.		
59	Set RELAY TIME SELECTORS CHANNEL A switch (S17) to OFF, and set CHANNEL B switch (S18) to BRAKE.			
60	At power panel set +24 VDC ON/OFF switch to ON.	GUN MOTOR indicator (DS13) lights.	Refer to fig. FO-7, sheet 1 and check GUN MOTOR indicator (DS13) for open condition. Refer to fig. FO-7, sheet 7 and check	Fig. FO-7, Sheets 1 and 7.

Table 6-6. Distribution Box Panel 2A1A2. Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
60(cont)			RELAY TIME SELECTOR CHANNEL A switch (S17-J10) for open condition.	
61	At power panel set +24 VDC ON/OFF switch to OFF.	GUN MOTOR indicator (DS13) goes out.		
62	Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to OFF.	+24 VDC indicator (DS24) goes out.		
63	Remove test probe W286 from between power panel controlled +24 VDC test point and connect to power panel +24 VDC GRD test point. NOTE Leave connection in place for step 64 only. Step 65 contains instructions to remove the connection.			
64	Set RELAY TIME SELECTOR CHANNEL A switch (S17) to K6, and set CHANNEL B switch (S18) to K11. Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to ON.	+24 VDC indicator (DS24) and K3 indicator (DS4) light.	Refer to fig. FO-7, sheet 1, and check K3 indicator (DS4) for open condition. Refer to fig. FO-7, sheet 7, and check RELAY TIME SELECTOR CHANNEL A switch (S17-H2) for open condition.	Fig. FO-7, sheets 1 and 7.

Table 6-6. Distribution Box Panel 2A1A2. Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
65	Remove test probe W286 from TEST POINTS 6 and power panel +24 VDC GRD test point. Connect W286 to TEST POINTS 7 and power panel controlled +24 VDC test point. NOTE Leave connection in place for steps 66 through 73. Step 74 contains instructions to remove the connection.	K3 indicator (DS4) goes out.		
66	Set RELAY TIME SELECTORS CHANNEL B switch (S18) to K8.			
67	At power panel set +24 VDC ON/OFF switch to ON.	K4 indicator (DS5) lights.	Refer to fig. FO-7, sheet 1, and check K4 indicator (DS5) for open condition. Refer to fig. FO-7, sheet 7, and check RELAY TIME SELECTOR CHANNEL B switch (S18-CA) for open condition.	Fig. FO-7, sheets 1 and 7.

Table 6-6. Distribution Box Panel 2A1A2. Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
68	Set RELAY TIME SELECTORS CHANNEL B switch (S18) to K9.	K4 indicator (DS5) goes out, and ELEVATION AMPL indicator (DS14) lights.	Refer to fig. FO-7, sheet 6, and check ELEVATION AMPL indicator (DS14) for open condition. Refer to fig. FO-7, sheet 7, and check RELAY TIME SELECTOR CHANNEL B switch (S18-C5) for open condition.	Fig. FO-7, sheets 6 and 7.
69	At power panel set +24 VDC ON/OFF switch to OFF.	ELEVATION AMPL indicator (DS14) goes out.		
70	Set RELAY TIME SELECTORS CHANNEL B switch (S18) to BRAKE.			
71	At power panel set +24 VDC ON/OFF switch to ON.	AZIMUTH AMPL NO. 2 indicator (DS16) lights.	Refer to fig. FO-7, sheet 6, and check AZIMUTH AMPL NO. 2 indicator (DS16) for open condition. Refer to fig. FO-7, sheet 7, and check RELAY TIME SELECTOR CHANNEL B switch (S18-C9) for open condition.	Fig. FO-7, sheets 6 and 7.

Table 6-6. Distributiion Box Panel 2A1A2. Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
72	Set RELAY TIME SELECTORS CHANNEL B switch (S18) to OFF.	AZIMUTH AMPL NO. 2 indicator (DS16) goes out, and AZIMUTH AMPL NO. 1 indicator (DS15) lights.	Refer to fig. FO-7, sheet 6, and check AZIMUTH AMPL NO. 1 indicator (DS15) for open condition. Refer to fig. FO-7, sheet 7, and check RELAY TIME SELECTOR CHANNEL B switch (S18-C10) for open condition.	Fig. FO-7, sheets 6 and 7.
73	At power panel set +24 VDC ON/OFF switch to OFF and set DISTRIBUTION +24 VDC ON/OFF switch to OFF.	AZIMUTH AMPL NO. 1 indicator (DS15), and +24 VDC indicator (DS24) go out. At power panel +24 VDC indicator and UNIT NO. 1 indicators go out.		
74	Remove test probe W286 from TEST POINTS 7 and power panel +24 VDC test point. Remove relay time circuit card (2A1A2A7) and the extender board assembly. Insert relay time circuit card back into its distribution box panel connector (A7).			

Table 6-6. Distribution Box Panel 2A1A2. Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
74(cont)	Insert relay sense resistors circuit card (2A1A2A2) into its distribution box panel connector (A2). Remove K6 operation and sequence circuit card (2A1A2A4) and insert AN/TSM-100 extender board assembly (10554270 or 10554271) into distribution box connector A4. Insert K6 operation and sequence circuit card (2A1A2A4) into connector on top of extender board assembly. NOTE Leave (A4) circuit card inserted in extender board assembly for steps 75 through 88. Step 89 contains instructions to remove extender board assembly and insert circuit card into its distribution box panel connector.			
75	Set TEST SYSTEM POWER +5 VDC switch (S15) to OFF. Set TEST SYSTEM POWER +24 VDC switch (S16) to OFF. Set RELAY TIME SELECTORS			

Table 6-6. Distribution Box Panel 2A1A2. Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
75(cont)	CHANNEL A switch (S17) to K8 and set RELAY TIME SELECTORS CHANNEL B switch (S18) to BRAKE. Connect test probe W286 between TEST POINTS 6 and power panel controlled +24 VDC test point. NOTE Leave connection in place for steps 76 through 116. Step 117 contains instructions to remove the connection.			
76	At power panel set DISTRIBUTION +24 VDC ON/OFF switch to ON.	At power panel +24 VDC indicator and UNIT NO. 1 indicator light.		
77	Set TEST SYSTEM POWER +5 VDC switch (S15) to ON. Set TEST SYSTEM POWER +24 VDC switch (S16) to ON. Set TRIGGER switch (S9) to ON.	+5VDC indicator (DS23) and +24 VDC indicator (DS24) light.		
	Depress and release RESET pushbutton switch (S19)	K6 indicator (DS2) does not light.	Perform K6 operation and sequence circuit card test and troubleshooting procedures, table 6-21.	Fig. FO-17, fig. FO-7, sheet 3.

Table 6-6. Distribution Box Panel 2A1A2, Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
78	Measure voltage (dc) between extender board assembly A4-23 (+) and A4-28 (-) test points.	+17.1 to +18.9 Vdc.	Perform troubleshooting procedure, table 6-7, step A1.	Fig. FO-7, sheet 3.
79	At power panel set +24 VDC ON/OFF switch to ON.	K6 indicator (DS2) lights.	Refer to fig. FO-7 sheet 3. Check A4-21 for 0 volts and DS2 associated wiring. Perform troubleshooting procedure, table 6-7, steps AN, AO and AP in sequence.	Fig. FO-7, sheets 2, 3 and 7, fig. FO-17.
80	Measure voltage (dc) between extender board assembly A4-23 (+) and A4-28 (-) test points.	Less than +2.0 Vdc.	Perform K6 operation and sequence circuit card test and troubleshooting procedures, table 6-21.	Fig. FO-17, fig. FO-7, sheet 3.
81	At power panel set +24 VDC ON/OFF switch to OFF.	K6 indicator (DS2) does not go out.	Perform troubleshooting procedures, table 6-7, step AW.	Fig. FO-17, fig. FO-7, sheet 3.
82	Set TRIGGER switch (S9) to OFF.	K6 indicator (DS2) does not go out.	Perform K6 operation and sequence circuit card test and troubleshooting procedures, table 6-21.	
83	Depress and release RESET pushbutton switch (S19)	K6 indicator (DS2) goes out.	Perform K6 operation and sequence circuit card test and troubleshooting procedures, table 6-21.	Fig. FO-17, fig. FO-7, sheets 1 and 3.

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Table 6-6. Distribution Box Panel 2A1A2. Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
84	At power panel set +24 VDC ON/OFF switch to ON, for at least two seconds, and then to OFF.	K6 indicator (DS2) lights while power panel +24 VDC switch is ON and goes out when switch is set to OFF.	Perform troubleshooting procedures, table 6-7, steps AZ and BA in sequence.	Fig. FO-7, sheet 3.
85	Set TRIGGER switch (S9) and BURST LIMIT switch (S10) to ON.			
86	Depress and release RESET pushbutton switch (S19). At power panel set +24 VDC ON/OFF switch to ON, for at least two seconds, and then to OFF.	K6 indicator (DS2) lights while power panel +24 VDC switch is set to ON and goes out when switch is set to OFF.	Perform troubleshooting procedure, table 6-7, step BE.	Fig. FO-7, sheet 3.
87	Set BURST LIMIT switch (S10) to OFF, and set LAST ROUND switch (S1) to ON. Depress and release RESET pushbutton switch (S19).			
88	At power panel set +24 VDC ON/OFF switch to ON, for at least two seconds, and then to OFF.	K6 indicator (DS2) lights while power panel +24 VDC switch is on and goes out when switch is set to OFF.	Perform troubleshooting procedure, table 6-7, step BH.	Fig. FO-7, sheet 3.
89	Set LAST ROUND ON/OFF switch (S1) to OFF. Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to OFF.			

Table 6-6. Distribution Box Panel 2A1A2. Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
89(cont)	Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to OFF. Remove K6 operation and sequence circuit card (2A1A-2A4) and the extender board. Insert K6 operation and sequence circuit card into connector A4. Remove relay sense and K12 operation circuit card (2A1A2A3) and insert extender board assembly (10554270 or 10554271) into distribution box panel connector (A3). Insert relay sense and K12 operation circuit card into connector on top of extender board assembly. NOTE Leave (A3) circuit card inserted in extender board assembly for steps 90 through 104. Step 105 contains instructions to remove extender board assembly and insert circuit card back into distribution box panel connector.	+5 VDC indicator goes out.		

Table 6-6. Distribution Box Panel 2A1A2. Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
90	Set RELAY TIME SELECTORS CHANNEL A switch (S17) to K7, and CHANNEL B switch (S18) to K10. Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to ON. Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to ON.	K7 indicator (DS6) does not light.	Perform troubleshooting procedure, table 6-7, step BK.	Fig. FO-7, sheets 2 and 7.
91	At power panel set +24 VDC ON/OFF switch to ON.	K7 indicator (DS6) lights.	Refer to fig. FO-7, sheet 2. Check A3-19 for 0.0 Vdc. Check DS6 and associated wiring. Perform troubleshooting procedure, table 6-7, step BL.	Fig. FO-7, sheet 2.
92	At power panel set +24 VDC ON/OFF switch to OFF.	K7 indicator (DS6) goes out.		
93	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to OFF. Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to OFF.			
94	Set RELAY TIME SELECTOR CHANNEL A switch (S17) to OFF and set CHANNEL B switch (S18) to K10.			

Table 6-6. Distribution Box Panel 2A1A2. Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
94(cont)	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to ON. Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to ON.	K9 indicator (DS8) does not light.	Perform troubleshooting procedure, table 6-7, step BN.	Fig. FO-15, fig. FO-7, sheet 2.
95	At power panel set +24 VDC ON/OFF switch to ON.	K9 indicator (DS8) lights.	Refer to fig. FO-7, sheet 2. Check A3-27 for 0.0 Vdc. Check DS8 and associated wiring. Perform troubleshooting procedure, table 6-7, step BO.	Fig. FO-7, sheets 2 and 7.
96	At power panel set +24 VDC ON/OFF switch to OFF.	K9 indicator (DS8) goes out.		
97	Set both RELAY TIME SELECTORS CHANNEL A and CHANNEL B switches (S17 and S18) to K12 and measure voltage (dc) between INPUT A connector (J18) and GRD test point (TP3), and between INPUT B connector (J19) and GRD test point (TP3).	+17.1 to +18.9 Vdc.	Perform troubleshooting procedure, table 6-7, step BT.	Fig. FO-7, sheets 2 and 6.
98	Set RELAY TIME SELECTORS CHANNEL A switch (S17) to K6, and set CHANNEL B switch (S18) to K7.			

Table 6-6. Distribution Box Panel 2A1A2. Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
98(cont)	Depress and release RESET pushbutton switch (S19).			
99	At power panel set +24 VDC ON/OFF switch to ON.	K12 indicator (DS11) does not light.	Perform relay sense and K12 operation circuit card test and troubleshooting procedures, table 6-20.	Fig. FO-7, sheet 2, fig. FO-16.
100	Measure voltage between extender board assembly A3-2 (+) and A3-1 (-) test points.	Less than +2.0 Vdc.	Perform troubleshooting procedure, table 6-7, step BU.	Fig. FO-7, sheets 2 and 7.
101	Set LAST ROUND ON/OFF switch (S1) to ON.	K12 indicator (DS11) does not light.	Perform relay sense and K12 operation circuit card test and troubleshooting procedures, table 6-20.	Fig. FO-7, sheets 1 and 2, fig. FO-16.
	NOTE Wait for at least two seconds after setting LAST ROUND switch to ON before performing next step.			
102	At power panel set +24 VDC ON/OFF to OFF.	K12 indicator (DS11) lights.	Refer to fig. FO-7, sheet 2, measure between A3-3 (+) and ground on extender board for zero volts. Check DS11 and associated wiring.	

Table 6-6. Distribution Box Panel 2A1A2. Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
102 (cont)			Perform fault isolation procedures, table 6-7, steps BV, BW, and BX in sequence.	
103	Set LAST ROUND ON/OFF switch (S1) to OFF.	K12 indicator (DS11) does not go out.	Perform relay sense and K12 operation circuit card test and troubleshooting procedures, table 6-20.	Fig. FO-7, sheets 1 and 2, fig. FO-16.
104	Depress and release RESET pushbutton switch (S19).	K12 indicator (DS11) goes out.	Perform relay sense and K12 operation circuit card test and troubleshooting procedures, table 6-20.	Fig. FO-7, sheets 1 and 2, fig. FO-16.
105	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to OFF. Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to OFF. Remove relay sense and K12 operation circuit card (2A1A2A3) and the extender board. Insert relay sense and K12 operation circuit card (2A1A2A3) back into connector (A3).			

Table 6-6. Distribution Box Panel 2A1A2. Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
105(cont)	NOTE Make sure all circuit cards are firmly seated in distribution box panel and secure hinged bracket which retains circuit cards.			
	Set CLEAR MODE switch (S4) to AUTO.			
	Disengage panel track locks, slide panel assembly into AN/TSM-100, and secure fasteners.			
	Assure TRIGGER ON/OFF switch (S9) is in the ON position.			
	Set RELAY TIME SELECTORS CHANNEL A switch (S17) to OFF, and set CHANNEL B switch (S18) to K5.			
	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to ON.			
	Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to ON.			
	Depress and release RESET pushbutton switch (S19).	K11 indicator (DS10) does not light.	Perform K11 operation and sequence circuit card (2A1-A2A6) test and troubleshooting procedures, table 6-23.	Fig. FO-7, sheets 1 and 5, fig. FO-19.

Table 6-6. Distribution Box Panel 2A1A2. Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
106	At power panel set +24 VDC ON/OFF switch to ON.	K11 indicator (DS10) does not light.	Perform K11 operation and sequence circuit card test and troubleshooting procedures, table 6-23.	Fig. FO-7, sheet 5, fig. FO-19.
107	Set TRIGGER ON/OFF switch (S9) to OFF.	K11 indicator (DS10) does not light.	Perform K11 operation and sequence circuit card test and troubleshooting procedures, table 6-23.	Fig. FO-7, sheets 1 and 5, fig. FO-19.
	NOTE Wait for at least two seconds after setting TRIGGER switch to OFF before performing next step.			
108	At power panel set +24 VDC ON/OFF switch to OFF.	K11 indicator (DS10) lights.	Refer to fig. FO-7, sheet 5. Check A6-27 to GRD for 0.0 Vdc. Check DS10 and associated wiring. Perform fault isolation procedures, table 6-7, steps BY, BZ, CA and CB sequence.	Fig. FO-7, sheets 1, 5 and 7.

Table 6-6. Distribution Box Panel 2A1A2. Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
109	Set TRIGGER ON/OFF switch (S9) to ON. Depress and release RESET pushbutton switch (S19).	K11 indicator (DS10) goes out.	Perform K11 operation and sequence circuit card test and troubleshooting procedures, table 6-23.	Fig. FO-7, sheet 5, fig. FO-19.
110	At power panel set +24 VDC ON/OFF switch to ON.			
111	Set BURST LIMIT ON/OFF switch (S10) to ON.	K11 indicator (DS10) does not light.	Perform K11 operation and sequence circuit card test and troubleshooting procedures, table 6-23.	Fig. FO-7, sheet 5, fig. FO-19.
	NOTE Wait for at least two seconds after setting BURST LIMIT switch to ON before performing next step.			
112	At power panel set +24 VDC test point control ON/OFF switch to OFF.	K11 indicator (DS10) lights.	Perform K11 operation and sequence circuit card test and troubleshooting procedures, table 6-23.	Fig. FO-7, sheet 5, fig. FO-19.
113	Set BURST LIMIT ON/OFF switch (S10) to OFF.			

Table 6-6. Distribution Box Panel 2A1A2. Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
113(cont)	Set TRIGGER ON/OFF switch (S9) to OFF.			
	Set CLEAR MODE switch (S4) to OFF.			
	Depress and release RESET pushbutton switch (S19).	K11 indicator (DS10) goes out.	Perform K11 operation and sequence circuit card test and troubleshooting procedures, table 6-23.	Fig. FO-7, sheet 5, fig. FO-19.
114	At power panel set +24 VDC ON/OFF switch to ON.			
115	Set CLEAR MODE switch to MAN, for at least two seconds, and then to OFF.	K11 indicator (DS10) does not light.	Perform K11 operation and sequence circuit card test and troubleshooting procedures, table 6-23.	Fig. FO-7, sheets 1 and 5, fig. FO-19.
	NOTE Wait for at least two seconds after setting CLEAR MODE switch to MAN and then OFF before performing next step.			
116	At power panel set +24 VDC ON/OFF switch to OFF.	K11 indicator (DS10) lights.	Perform troubleshooting procedure, table 6-7, step CB.	Fig. FO-7, sheets 1 and 5.
117	Depress and release RESET	K11 indicator (DS10)		

Table 6-6. Distribution Box Panel 2A1A2. Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
117(cont)	pushbutton switch (S19).	goes out.		
	Remove test probe W286 from TEST POINTS 6 and power panel controlled +24 VDC test point.			
	Set RELAY TIME SELECTORS CHANNEL A switch (S17) to K12, and set CHANNEL B switch (S18) to K8.			
	Set ACQ TIME ON/OFF switch (S11) to ON.			
	Measure voltage (dc) between TEST POINTS 6 and GRD test point (TP3).	+22.0 to +28.0 Vdc.	Refer to fig. FO-7 sheets 6 and 7, and check ACQ TIME switch (S11) and RELAY TIME SELECTOR CHANNEL A switch (S17-E8) for open condition.	Fig. FO-7, sheets 6 and 7.
118	Set ACQ TIME ON/OFF switch (S11) to OFF.		Refer to fig. FO-7, sheets 6 and 7, and check ACQ TIME switch (S11), EL LIMIT ON/OFF switch (S12) and RELAY TIME SELECTOR CHANNEL B switch (S18) for open condition.	Fig. FO-7, sheets 6 and 7.
	Set EL LIMIT ON/OFF switch (S12) to ON.			
	Measure voltage (dc) between TEST POINTS 9 and GRD test point (TP3).	+22.0 to +28.0 Vdc.		
119	Set EL LIMIT ON/OFF switch (S12) to OFF.			
	Set RELAY TIME SELECTOR CHANNEL A switch (S17) to K11.			

Table 6-6. Distribution Box Panel 2A1A2. Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
119(cont)	Set LEFT LIMIT ON/OFF switch (S14) to ON.			
	Measure voltage (dc) between TEST POINTS 6 and GRD test point (TP3).	+22.0 to +28.0 Vdc.	Refer to fig. FO-7, sheets 6 and 7, and check LEFT LIMIT switch (S14) and RELAY TIME SELECTOR CHANNEL A switch (S17-E7) for open condition.	Fig. FO-7, sheets 6 and 7.
120	Set LEFT LIMIT ON/OFF switch (S14) to OFF.			
	Set RELAY TIME SELECTOR CHANNEL B switch (S18) to K10.			
	Set RIGHT LIMIT ON/OFF switch (S13) to ON.			
	Measure voltage (dc) between TEST POINTS 9 and GRD test point (TP3).	+22.0 to +28.0 Vdc.	Refer to fig. FO-7 sheets 6 and 7, and check RIGHT LIMIT switch (S13) and RELAY TIME SELECTOR CHANNEL B switch (S18-E6) for open condition.	Fig. FO-7, sheets 6 and 7.
121	Set RIGHT LIMIT ON/OFF switch (S13) to OFF.			
	Set TEST SYSTEM POWER +5 VDC switch (S15) to OFF.	+5 VDC (DS23) and +24 VDC (DS24) indicators go out.		
	Set TEST SYSTEM POWER +24 VDC switch (S16) to OFF.			

Table 6-6. Distributon Box Panel 2A1A2. Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
122	At power panel set DISTRIBUTION +24 VDC ON/OFF switch and 115V 400 CY 1 PHASE switch to OFF. Make sure all AN/TSM-100 ON/OFF switches are in the OFF position and all circuit breakers are set in.	At power panel +24 VDC and 115V 400 CY 1 PHASE indicators go out. At battery charger (2A1A4), AC indicator goes out.		

Table 6-7. Distribution Box Panel 2A1A2, Troubleshooting Procedures

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
A	At power panel (2A1A3) set DISTRIBUTION switch to +24 VDC ONLY.			
B	Remove K6 operation and sequence circuit card (2A1A-2A4) and insert AN/TSM-100 extender board assembly (10554270 or 10554271) into distribution box panel connector A4.			
C	At power panel set DISTRIBUTION switch to DB.			
D	Refer to fig. FO-7, sheet 1 and measure voltage (dc) between extender board assembly (A4-13) test point and GRD test point (TP3) and between extender board assembly (A4-6) test point and GRD test point (TP3).	+2.80 to +5.0 Vdc at extender board assembly (A4-13) test point. +22.0 to +28.0 Vdc at extender board assembly (A4-6) test point.	Perform K6 operation and sequence circuit card and troubleshooting procedures, table 6-21.	If 5 Vdc is missing at extender board assembly (A4-13) test point, perform step E. If 24 Vdc is missing at extender board assembly (A4-6) test point, perform power panel (2A1A3) test procedures, table 6-2.
E	At AN/TPM-22 Radar Test Set (UNIT 1), remove terminal board cover on right side of vertical console.			
	Refer to fig. FO-4 and measure voltage (dc) between TB14-7 (+) and TB14-8 (-).	+2.80 to +5.0 Vdc.	Refer to fig. FO-7, sheet 1, and check TEST SYSTEM	Refer to AN/TPM-22 Radar Test Set (UNIT 1) manual

Table 6-7. Distribution Box Panel 2A1A2, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
E(cont)			POWER +5 VDC switch (S15) for open condition.	test procedures.
F	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) and TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to OFF. Remove relay time circuit card (2A1A2A7) and insert AN/TSM-100 extender board assembly (10554270 or 10554271) into distribution box panel connector (A7). Refer to fig. FO-7, sheet 6, and measure resistance between extender board assembly A7-2 test point and INPUT A coaxial connector (J18), and between extender board assembly A7-2 test point and INPUT B coaxial connector (J19).	Less than 2.5 ohms.	Perform step G.	Check RELAY TIME SELECTORS CHANNEL A and CHANNEL B switches (S17-A1 and S18-A1) for open condition.
G	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to ON. Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to ON. Refer to fig. FO-7, sheet 6, and measure voltage (dc) between extender board assembly A7-24 (+) and A7-1 (-) test points.	+22.0 to +28.0 Vdc.	Perform relay time circuit card (2A1A2A7) test and troubleshooting procedures, table 6-24.	Refer to fig. FO-7, sheet 2, and check resistor R1 for shorted condition.

Table 6-7. Distribution Box Panel 2A1A2, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
H	At power panel set +24 VDC ON/OFF switch to OFF.			
I	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to OFF. Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to OFF. Refer to fig. FO-7, sheet 6, and measure resistance between extender board assembly A7-3 test point and TEST POINT 6.	Less than 2.5 ohms.	Refer to fig. FO-7, sheet 1 and check K5 indicator (DS1) for open condition.	Refer to fig. FO-7, sheet 7 and check RELAY TIME SELECTOR CHANNEL A switch (S17-G5) and RELAY TIME SELECTOR CHANNEL B switch (S18-B6) for open condition.
J	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to OFF. Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to OFF. Refer to fig. FO-7, sheet 6, and measure resistance between extender board assembly A7-8 test point and INPUT A coaxial connector (J18), and INPUT B coaxial connector (J19).	Less than 2.5 ohms.	Perform relay time circuit card test and troubleshooting procedures, table 6-24.	Refer to fig. FO-7, sheet 6, and check RELAY TIME SELECTORS CHANNEL A and CHANNEL B switches (S17-A4 and S18-A4) for open condition.

Table 6-7. Distribution Box Panel 2A1A2, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
K	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to OFF. Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to OFF. Remove K8 operation and sequence circuit card (2A1A2A5) and insert AN/TSM-100 extender board assembly (10554270 or 1055-4271) not being used to extend relay time circuit card (2A1A2A7) into distribution box panel connector (A5).			
	Refer to fig. FO-7, sheets 1 and 4, and measure resistance between extender board assembly A5-3 test point and GRD test point (TP3).	612 to 748 ohms.	Perform K8 operation and sequence circuit card (2A1A2-A5) test and troubleshooting procedures, table 6-22.	Perform relay sense resistors circuit card (2A1A2A2) test and troubleshooting procedures.
L	Check A1-10 to GND then depress RESET button.	+5.0 Vdc 0.0 Vdc		Fig. FO-7, sheet 1.
	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to OFF. Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to OFF. Remove K8 operation and sequence circuit card (2A1A-2A5) and insert AN/TSM-100 extender board assembly (10554270 or 10554271), not being used to extend relay time circuit card (2A1A2A7)			

Table 6-7. Distribution Box Panel 2A1A2, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
L(cont)	into distribution box panel connector (A5). Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to ON. Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to ON. Refer to fig. FO-7, sheet 4, and measure voltage (dc) between the following extender board assembly test points (+) and extender board assembly A5-1 (-) test point:		Perform steps M and N in sequence.	If 18 Vdc at extender board assembly A5-25 test point, refer to fig. FO-7, sheet 2, and check resistor R1 for open and zener diode CR1 for proper operation. If +5 Vdc at extender board assembly A5-11 test point, perform step Q.
	A5-27	+22.0 to +28.0 Vdc		
	A5-25	+17.1 to +18.9 Vdc		
	A5-13	+2.80 to + 5.0 Vdc		
	A5-11	+2.80 to + 5.0 Vdc		
M	At power panel set +24 VDC ON/OFF test point control switch to ON.			
N	Refer to fig. FO-7, sheet 4, and measure voltage (dc) between extender board assembly A5-3 (+) and A5-1 (-) test points.	+2.80 to +5.0 Vdc.	Perform K8 operation and sequence circuit card test and troubleshooting procedures, table 6-22.	Perform steps O and P in sequence.
O	At power panel set +24 VDC ON/OFF test point control switch to OFF.			

Table 6-7. Distribution Box Panel 2A1A2, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
P	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to OFF.			
	Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to OFF.			
	Remove relay sense resistors circuit card (2A1A2A2) and extender board assembly, inserted in distribution box connector (A5) (step L).			
	Insert extender board assembly, removed from distribution box panel connector A2.			
	Refer to fig. FO-7, sheet 2, and measure resistance between extender board assembly A2-17 test point and TEST POINTS 6.	Less than 2.5 ohms.	Perform relay sense resistors circuit card (2A1A2A2) test and troubleshooting procedures, table 6-19.	Refer to fig. FO-7 sheet 7 and check RELAY TIME SELECTOR CHANNEL A switch (S17-D7) and RELAY TIME SELECTOR CHANNEL B switch (S18-B3) for open condition.
Q	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to OFF.			
	Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to OFF.			
	Remove logic function resistors circuit card (2A1A2A1) and extender board assembly, inserted in distribution			

Table 6-7. Distribution Box Panel 2A1A2, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
Q(cont)	box panel connector (A5) (step L). Insert extender board assembly, removed from distribution box panel connector (A5), into distribution box panel connector (A1). Refer to fig. FO-7, sheet 1, and measure resistance between extender board assembly A1-16 test point and GRD test point (TP3).	Over 500k ohms.	Perform logic function resistors circuit card test and troubleshooting procedures, table 6-18.	Check RATE switch (S8-A) for shorted condition.
R	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to OFF. Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to OFF. Remove noise suppression circuit card (2A1A2A8). Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to ON. Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to ON. Depress and release RESET pushbutton switch (S19).			
S	At power panel set +24 VDC ON/OFF test point control switch to ON, for at least two seconds, and then to OFF.	K8 indicator (DS7) does not light while power panel +24 VDC ON/OFF switch is set to ON and lights when switch is set to OFF.	Perform noise suppression circuit card test and troubleshooting procedures test, table 6-25.	Perform step T.

Table 6-7. Distribution Box Panel 2A1A2, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
T	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to OFF.			
	Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to OFF.			
	Remove K8 operation and sequence circuit card (2A1A2A5) and insert AN/TSM-100 extender board assembly (10554270 or 10554271), not being used to extend relay time circuit card (2A1A2A7) into distribution box panel connector (A5).			
	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to ON.			
	Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to ON.			
	Refer to fig. FO-7, sheet 4, and measure voltage (dc) between extender board assembly A5-9 test point and GRD test point (TP3), and between extender board assembly A5-11 test point and GRD test point (TP3).	+2.80 to +5.0 Vdc at extender board assembly A5-9 test point. Less than 0.9 Vdc at extender board assembly, A5-11 test point.	Perform K8 operation and sequence circuit card test and troubleshooting procedures, table 6-22.	Perform step U.
U	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to OFF.			
	Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to OFF.			

Table 6-7. Distribution Box Panel 2A1A2, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
U(cont)	Remove logic function resistors circuit card (2A1A2A1) and extender board assembly, inserted in distribution box panel connector A5 (step T). Insert extender board assembly, removed from distribution box panel connector (A5), into distribution box panel connector (A1).			
	Refer to fig. FO-7, sheet 1, and measure resistance between extender board assembly A1-16 test point and GRD test point (TP3) and between extender board assembly A1-10 test point and GRD test point (TP3).	Less than 2.5 ohms between extender board assembly A1-16 and GRD. Over 500k ohms between extender board assembly A1-10 and GRD.	Perform logic function resistors circuit card (2A1A-2A1) test and troubleshooting procedures, table 6-18.	If 2.5 ohms between extender board assembly A1-16 and GRD, check RATE switch (S8-A) for open condition. If 500k ohms between extender board assembly A1-10 and GRD, check RESET pushbutton switch (S19) for shorted condition.
V	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to OFF. Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to OFF. Remove K8 operation and sequence circuit card (2A1A2A5) and insert AN/TSM-100 extender board			

Table 6-7. Distribution Box Panel 2A1A2, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
V(cont)	assembly (10554270 or 10554271), not being used to extend relay time circuit card (2A1A2A7) into distribution box panel connector (A5).			
	Refer to fig. FO-7, sheets 1 and 4, and measure resistance between extender board assembly A5-9 test point and GRD test point (TP3) with RESET pushbutton switch (S19) depressed and held in.	Less than 2.5 ohms.	Perform K8 operation and sequence circuit card test and troubleshooting procedures, table 6-22.	Check RESET pushbutton switch (S19) for open condition. Perform logic function resistors, circuit card test and troubleshooting procedures, table 6-18.
W	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to OFF. Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to OFF.			
	Refer to fig. FO-7, sheet 6, and measure resistance between extender board assembly A7-5 test point and INPUT A connector (J18), and between extender board assembly A7-5 test point and INPUT B connector (J19).	Less than 2.5 ohms.	Perform relay time circuit card test and troubleshooting procedures, table 6-24.	Check RELAY TIME SELECTORS CHANNEL A and CHANNEL B switches (S17-A6 and S18-A6) for open condition.
X	At power panel (2A1A3) set VDC ON/OFF test point control switch to OFF.			
Y	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15)			

Table 6-7. Distribution Box Panel 2A1A2, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
Y(cont)	to OFF. Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to OFF.			
	Refer to fig. FO-7, sheet 6, and measure resistance between extender board assembly A7-7 test point and TEST POINT 6.	Less than 2.5 ohms.	Refer to fig. FO-7, sheet 2, and check K10 indicator (DS9) for open condition.	Refer to fig. FO-7, sheet 7, and check RELAY TIME SELECTOR CHANNEL A switch (S17-D5) for open condition.
Z	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to OFF. Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to OFF.			
	Refer to fig. FO-7, sheet 6, and measure resistance between extender board assembly A7-11 test point and INPUT A coaxial connector (J18), and between extender board assembly A7-11 test point and INPUT B coaxial connector (J19).	Less than 2.5 ohms.	Perform relay time circuit card (2A1A-2A7) test, table 6-24.	Check RELAY TIME SELECTORS CHANNEL A and CHANNEL B switches (S17-A7 and S18-A7) for open condition.
AA	Refer to fig. FO-7, sheet 6, and measure voltage (dc) between extender board assembly A7-12 (+) and A7-1 (-) test points.	+22.0 to +28.0 Vdc.	Perform relay time circuit card test and troubleshooting procedures, table 6-24.	Refer to fig. FO-7, sheet 7, and check RELAY TIME SELECTOR CHANNEL A switch (S17-B10) and RELAY TIME SELECTOR CHANNEL B switch (S18-

Table 6-7. Distribution Box Panel 2A1A2, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
AA(cont)				B1) for open condition.
AB	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to OFF.			
	Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to OFF.			
	Refer to fig. FO-7, sheet 6, and measure resistance between extender board assembly A7-11 test point and INPUT A coaxial connector (J18), and between extender board assembly A7-11 test point and INPUT B coaxial connector (J19).	Less than 2.5 ohms.	Perform relay time circuit card test and troubleshooting procedures, table 6-24.	Check RELAY TIME SELECTORS CHANNEL A and CHANNEL B switches (S17-A9 and S18-A9) for open condition.
AC	At power panel (2A1A3) set +24 VDC ON/OFF test point control switch to OFF.			
AD	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to OFF.			
	Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to OFF.			
	Refer to fig. FO-7, sheet 6, and measure resistance between extender board assembly A7-9 test point and TEST POINTS 6.	Less than 2.5 ohms.	Check BRAKE indicator (DS12) for open condition.	Refer to fig. FO-7, sheet 7, and check RELAY TIME SELECTOR CHANNEL A switch (S17-J9) and RELAY TIME SELECTOR CHAN-

Table 6-7. Distribution Box Panel 2A1A2, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
AD(cont)				NEL B switch (S18-B9) for open condition.
AE	Check A1-10 to GND then depress RESET button. Refer to fig. FO-7, sheet 6, and measure voltage (dc) between extender board assembly A7-23 (+) and A7-1 (-) test points.	+5.0 Vdc 0.0 Vdc +1.0 to +2.0 Vdc.	Perform relay time circuit card test and troubleshooting procedures, table 6-24.	Fig. FO-7, sheet 1. Refer to fig. FO-7, sheet 7, and check RELAY TIME SELECTOR CHANNEL A switch (S17-H10) and RELAY TIME SELECTOR CHANNEL B switch (S18-B7) for open condition.
AF	Check A1-10 to GND then depress RESET button. Refer to fig. FO-7, sheet 6, and measure voltage (dc) between extender board assembly A7-21 (+) and A7-1 (-) test points	+5.0 Vdc 0.0 Vdc +1.0 to +2.0 Vdc	Perform relay time circuit card test and troubleshooting procedures, table 6-24.	Fig. FO-7, sheet 1. Check EL LIMIT switch (S12-C2) and RELAY TIME SELECTOR CHANNEL B switch (S18-C7) for open condition.
AG	Check A1-10 to GND then depress RESET button. Refer to fig. FO-7, sheet 6, and measure voltage (dc) between extender board assembly A7-19 (+) and A7-1 (-) test points.	+5.0 Vdc 0.0 Vdc +1.0 to +2.0 Vdc	Perform relay time circuit card test and troubleshooting procedures, table 6-24.	Fig. FO7, sheet 1. Check LEFT LIMIT switch (S14-C2) and RELAY TIME SELECTOR CHANNEL B switch (S18-D1) for open condition.

Table 6-7. Distribution Box Panel 2A1A2, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
AH	Check A1-10 to GND then depress RESET button. Refer to fig. FO-7, sheet 6, and measure voltage (+dc) between extender board assembly A7-17 (+) and A7-1 (-) test points.	+5.0 Vdc 0.0 Vdc +1.0 to +2.0 Vdc	Perform relay time circuit card test and troubleshooting procedures, table 6-24.	Check RIGHT LIMIT switch (S13-C2) and RELAY TIME SELECTOR CHANNEL B switch (S18 D2) for open condition.
AI	Refer to fig. FO-7, sheet 3, and measure voltage (dc) between extender board assembly A4-25 (+) and A4-28 (-) test points and between extender board assembly A4-19 (+) and A4-28 (-) test points.	+17.1 to +18.9 Vdc at extender board assembly Z4-25 test point. +2.80 to +5.0 Vdc at extender board assembly A4-19 test point.	Perform K6 operation and sequence circuit card (2A1A-2A4) test and troubleshooting procedures, table 6-21.	If A4-25 indication is abnormal refer to fig. FO-7, sheet 3. If A4-19 indication is abnormal perform steps AJ, AK, AL and AM in sequence.
AJ	At power panel (2A1A3) set DISTRIBUTION +24 VDC ON/OFF switch to OFF.			
AK	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to OFF. Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to OFF. Insert K6 operation and sequence circuit card (2A1A2A4) back into its distribution box panel connector (A4). Remove relay sense and K12 operation circuit card			

Table 6-7. Distribution Box Panel 2A1A2, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
AK(cont)	(2A1A2A3) and insert extender board assembly (10554270 or 10554271), not being used to extend the A4 circuit card assembly into distribution box panel connector (A3).			
AL	At power panel set DISTRIBUTION +24 VDC ON/OFF switch to ON.			
AM	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to ON. Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to ON. Refer to fig. FO-7, sheet 2, and measure voltage (dc) between A3-1 (-) and the following extender board assembly test points: A3-13 A3-7 A3-6	+1.8 to +5.0 Vdc Less than 0.9 Vdc Less than 0.9 Vdc	Perform relay sense and K12 operation circuit card (2A1A-2A3) test and troubleshooting procedures, table 6-20.	If indication is abnormal at A3-13 refer to fig. FO-7, sheet 2 and fig. FO-16 and check +5 VDC power source. If indication is abnormal at A3-7 and A3-6 test points, perform relay sense resistors circuit card test and troubleshooting procedures, table 6-19.
AN	Check A1-10 to GRD then depress RESET button.	+5.0 Vdc 0.0 Vdc		Fig. FO-7, sheet 1.

Table 6-7. Distribution Box Panel 2A1A2, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
AO	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to OFF. Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to OFF. Remove noise suppression circuit card, 2A1A2A8. Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to ON. Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to ON. Depress and release RESET pushbutton switch (S19).			
AP	At power panel, set +24 VDC ON/OFF to ON.	K6 indicator (DS2) lights.	Perform noise suppression circuit card (2A1A2A8) test and troubleshooting procedures, table 6-25.	Perform step AQ.
AQ	Refer to fig. FO-7, sheet 3, and measure voltage (dc) between extender board assembly A4-18 (+) and A4-28 (-) test points, and between A4-19 (+) and A4-28 (-) test points.	+28 to +5.0 Vdc at A4-18 test point. Less than 0.9 Vdc at A4-19 test point.	Perform K6 operation and sequence circuit card (2A1A2A-4) test and troubleshooting procedures, table 6-21.	If 0.9 Vdc or greater at A4-19 test point, perform steps AR, AS, AT, and AU in sequence. If indication at A4-18 is not normal refer to fig. FO-7, sheet 3.
AR	At power panel set DISTRIBUTION +24 VDC ON/OFF witch to OFF.			

Table 6-7. Distribution Box Panel 2A1A2, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
AS	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to OFF. Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to OFF. Remove relay sense and K12 operation circuit card and insert extender board assembly (10554270 or 1055-4271), not being used to extend the (A4) circuit card into distribution box panel connector (A3)			
AT	At power panel set DISTRIBUTION +24 VDC ON/OFF switch to ON.			
AU	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to ON. Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to ON. Refer to fig. FO-7, sheet 2, and measure voltage (dc) between extender board assembly and A3-6 (+) and A3-1 (-) test points and between extender board assembly A3-7 (+) and A3 (-) test points.	+1.4 to +5.0 Vdc at A3-6 test point. Less than 0.9 Vdc at A3-7 test point.	Perform relay sense and K12 operation circuit card test and troubleshooting procedures, table 6-20.	Perform step AV.
AV	Set power panel DISTRIBUTION +24 VDC ON/OFF switch to OFF.			

Table 6-7. Distribution Box Panel 2A1A2, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
AV(cont)	Remove the relay sense resistors circuit card (2A1A2A2) and insert the extender board assembly (10554270 or 10554271), previously (step AS) inserted in connector (A3), into distribution box panel connector A2. Set power panel DISTRIBUTION +24 VDC ON/OFF switch to ON.			
	Refer to fig. FO-7, sheet 2, and measure voltage (dc) between extender board assembly A2-27 (+) and A2-1 (-) test points.	+22.0 to +28.0 Vdc.	Perform relay sense resistors circuit card test and troubleshooting procedures, table 6-19.	Refer to fig. FO-7, sheet 7, and check RELAY TIME SELECTOR CHANNEL A switch (S17-J4) for open condition.
AW	Refer to fig. FO-7, sheet 3, and measure voltage (dc) between the following extender board assembly test points (+) and extender board assembly at A4-28 test point (-): A4-15 A4-16 A4-17	+2.8 to +5.0 Vdc.	Perform K6 operation and sequence circuit card (2A1A2-A4) test and troubleshooting procedures, table 6-21.	Perform steps AX and AY in sequence.
AX	At power panel set DISTRIBUTION +24 VDC ON/OFF switch to OFF.			
AY	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to OFF; set TEST SYSTEM			

Table 6-7. Distribution Box Panel 2A1A2, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
AY(cont)	POWER +24 VDC ON/OFF switch (S16) to OFF. Remove logic function resistors circuit card (2A1A2A1) and insert extender board assembly (10554270 or 10554271), not being used to extend circuit card (A4), into distribution box panel connector (A1).			
	Refer to fig. FO-7, sheet 1, and measure resistance between the following extender board assembly test points and GRD test point (TP3): A1-27 A1-11 A1-23	Over 500k ohms.	Perform logic function resistors circuit card (2A-1A2A1) test and troubleshooting procedures, table 6-18.	If 500k or less ohms between extender board assembly A1-27 and GRD, check TRIGGER switch (S9-C1) for shorted condition. If 500k or less ohms between extender board assembly A1-11 and GRD, check BURST LIMIT switch (S10-C1) for shorted condition. If 500k or less ohms between extender board assembly A1-23 and GRD, check LAST ROUND switch (S1-C2) for shorted condition.
AZ	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to OFF; set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to OFF.			

Table 6-7. Distribution Box Panel 2A1A2, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
AZ(cont)	Remove noise suppression circuit card (2A1A2A8). Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to ON. Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to ON. Depress and release RESET pushbutton switch (S19)			
BA	At power panel set +24 VDC ON/OFF switch to ON, for at least two seconds, and then to OFF.	K6 indicator (DS2) lights while power panel assembly +24 VDC switch is set to ON and goes out when switch is set to OFF.	Perform noise suppression circuit card test and troubleshooting procedures, table 6-25.	Perform step BB.
BB	Refer to fig. FO-7, sheet 3, and measure voltage (dc) between extender board assembly A4-17 (+) and A4-28 (-) test points.	Less than 0.9 Vdc.	Perform K6 operation and sequence circuit card assembly test and troubleshooting procedures, table 6-21.	Perform steps BC and BD in sequence.
BC	At power panel set DISTRIBUTION +24 VDC ON/OFF switch (S2) to OFF.			
BD	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to OFF. Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to OFF. Remove logic function resistors circuit card (2A1A2A1)			

Table 6-7. Distribution Box Panel 2A1A2, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
BD(cont)	and insert extender board assembly (10554270 or 10554271), not being used to extend circuit card (A4), into distribution box panel connector (A1).			
	Refer to fig. FO-7, sheet 1, and measure resistance between extender board assembly A1-27 test point and GRD test point (TP3).	Less than 2.5 ohms.	Perform logic function resistors circuit card test and troubleshooting procedures, table 6-18.	Check TRIGGER switch (S9-C1) for open condition.
BE	Refer to fig. FO-7, sheet 3, and measure voltage (dc) between extender board assembly A4-16 (+) and A4-28 (-) test points.	Less than 0.9 Vdc.	Perform K6 operation and sequence circuit card and troubleshooting procedures, table 6-21.	Perform steps BF and BG in sequence.
BF	At power panel set DISTRIBUTION +24 VDC ON/OFF switch (S2) to OFF.			
BG	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to OFF. Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to OFF. Remove logic function resistors circuit card (2A1A2A1) and insert extender board assembly (10554270 or 10554271) not being used to extend circuit card (A4) into			

Table 6-7. Distribution Box Panel 2A1A2, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
BG(Cont)	distribution box panel connector (A1)			
	Refer to fig. FO-7, sheet 1, and measure resistance between extender board assembly A1-11 test point and GRD test point (TP3).	Less than 2.5 ohms	Perform logic function resistors circuit card test and troubleshooting procedures.	Check BURST LIMIT switch (S10-C1) for open condition.
BH	Refer to fig. FO-7, sheet 3, and measure voltage (dc) between extender board assembly A4-15(+) and A4-28 (-) test points	Less than 0.9 Vdc.	Perform K6 operation and sequence circuit card test and troubleshooting procedures, table 6-21.	
BI	At power panel set DISTRIBUTION +24 VDC ON/OFF switch (S2) to OFF.			
BJ	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to OFF. Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to OFF. Remove logic function resistors circuit card (2A1A2A1) and insert extender board assembly (10554270 or 10554271), not being used to extend circuit card (A4) into distribution box panel connector (A1).			
	Refer to fig. FO-7, sheet 1, and measure resistance between extender board assembly A1-23 test point and GRD test point (TP3).	Less than 2.5 ohms.	Perform logic function resistors circuit card test and troubleshooting procedures, table 6-18.	Check LAST ROUND switch (S1-C2) for open condition.
BK	Set TEST SYSTEM POWER +5 VDC ON/OFFswitch (S15) to OFF.			

Table 6-7. Distribution Box Panel 2A1A2, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
BK(Cont)	Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to OFF.			
	Remove relay sense and K12 operation circuit card (2A1A2A3) inserted in connector in top of extender board assembly, inserted in distribution box panel connector (A3).			
	Refer to fig. FO-7, sheet 1, and measure resistance between extender board assembly A3-20 and A3-1 test points, and between A3-21 and A3-1 test points.	612 to 748 ohms.	Perform relay sense and K12 operation circuit card test, and troubleshooting procedures, table 6-20.	Perform relay sense resistors circuit card (2A1A2A2) test, and troubleshooting procedures, table 6-19.
BL	Check A1-10 to GRD then depress RESET button.	+5.0 Vdc 0.0 Vdc		Fig. FO-7, sheet 1.
	Refer to fig. FO-7, sheet 2, and measure voltage (dc) between the following extender board assembly test points (+) and extender board assembly A3-1 (-) test point: A3-25 A3-20 A3-21	+17.1 to +18.9 Vdc at A3-25 test point. +2.80 to +5.0 Vdc at A3-20 test point. Less than 0.9 Vdc at A3-21 test point.	Perform relay sense and K12 operation circuit card (2A1A2A3) test and troubleshooting procedures, table 6-20.	If indication at A3-25 is abnormal refer to fig. FO-7, sheet 2 or greater than 0.9 Vdc at extender board assembly A3-20 test point, perform step BM.
BM	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to OFF.			
	Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to OFF.			

Table 6-7. Distribution Box Panel 2A1A2, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
BM(Cont)	Remove the relay sense resistors circuit card (2A1A2A2) and insert the extender board assembly (10554270 or 10554271), not being used to extend the A3 circuit card, into distribution box connector (A2). Insert relay sense resistors circuit card into connector on top of extender board inserted in A2 connector. CAUTION Make sure A2 and A3 circuit cards and extender boards do not contact. Contact could cause arcing and damage to components. Insert insulating material (for instance, cardboard) between assemblies if necessary.			
	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to ON.			
	Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to ON.			
	Refer to fig. FO-7, sheet 1 and measure voltage (dc) between extender board	+22.0 to +28.0 Vdc.	Perform relay sense resistors circuit card test and	Refer to fig. FO-7, sheet 7, and check RELAY TIME

Table 6-7. Distribution Box Panel 2A1A2, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
BM(cont)	assembly A2-23 (+) and A2-7 (-) test points.		troubleshooting procedures, table 6-19.	SELECTOR CHANNEL A switch (S17-G3) for open condition.
BN	Set TEST SYSTEM POWER +5 VDC switch (S15) to OFF. Set TEST SYSTEM POWER +24 VDC switch (S16) to OFF. Remove relay sense and K12 operation circuit card (2A1A2A3) inserted in connector in top of extender board assembly inserted in distribution box panel connector (A3).			
	Refer to fig. FO-7, sheet 2, and measure resistance between extender board assembly A3-22 and A3-1 test points, and between A3-21 and A3-1 test points.	612 to 748 ohms.	Perform relay sense and K12 operation circuit card test and troubleshooting procedures, table 6-20.	Perform relay sense resistors circuit card test and troubleshooting procedures, table 6-19.
BO	Check A1-10 to GRD then depress RESET button.	+5.0 Vdc 0.0 Vdc		Fig. FO-7, sheet 1.
	Refer to fig. FO-7, sheet 2, and measure voltage (dc) between extender board assembly A3-22 (+) and A3-1 (-) test points, and between extender board assembly A3-23 (+) and A3-1 (-) test points.	+2.80 to +5.0 Vdc at extender board assembly A3-22 test point. Less than 0.9 Vdc at extender board assembly A3-23 test point.	Perform relay sense and K12 operation circuit card test and troubleshooting procedures, table 6-20.	Perform steps BP, BQ, BR, and BS in sequence.
BP	At power panel set +24 VDC ON/OFF switch (S15) to OFF.			

Table 6-7. Distribution Box Panel 2A1A2, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
BQ	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to OFF. Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to OFF. Remove relay sense resistors circuit card (2A1A2A2) and insert the extender board assembly (10554270 or 10554271), not being used to extend the circuit card (A3), into distribution box panel connector (A2).			
BR	At power panel set +24 VDC ON/OFF switch to ON.			
BS	Refer to fig. FO-7, sheet 2, and measure voltage (dc) between extender board assembly A2-19 (+) and A2-1 (-) test points.	+22.0 to +28.0 Vdc.	Perform relay sense resistors circuit card test and troubleshooting procedures, table 6-19.	Refer to fig. FO-7, sheet 7, and check RELAY TIME SELECTOR CHANNEL A switch (S17-G10) for open condition.
BT	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to OFF. Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to OFF. Refer to fig. FO-7, sheet 2, and measure resistance between extender board assembly A3-2 test point and INPUT A coaxial connector	 Less than 2.5 ohms.	 Perform relay sense and K12 operation circuit card test and troubleshooting procedures,	 Refer to fig. FO-7, sheet 6, and check RELAY TIME SELECTORS CHANNEL A and CHANNEL B

Table 6-7. Distribution Box Panel 2A1A2, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
BT(cont)	(J18), and between extender board assembly A3-2 test point and INPUT B coaxial connector (J19).		table 6-20.	switches (S17-A8 and S18-A8) for open condition.
BU	Refer to fig. FO-7, sheet 2, and measure voltage (dc) between the following extender board assembly test points (+) and extender board assembly A3-1 test point (-): A3-8 A3-9	+2.80 to +5.0 Vdc at A3-8 test point. Less than 0.9 Vdc at A3-9 test point.	Perform relay sense and K12 operation circuit card test and troubleshooting procedures, table 6-20.	Perform relay sense resistors circuit card test and troubleshooting procedures, table 6-19.
BV	Check A1-10 to GRD then depress RESET button. At power panel set +24 VDC ON/OFF switch to OFF.	+5.0 Vdc 0.0 Vdc		Fig. FO-7, sheet 1.
BW	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to OFF. Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to OFF. Remove noise suppression circuit card (2A1A2A8). Set TEST SYSTEM POWER +5 VDC switch (S15) to ON. Set TEST SYSTEM POWER +24 VDC switch (S16) to ON. Depress and release RESET pushbutton switch (S19).			
BX	At power panel set +24 VDC switch to ON for at least	K12 indicator (DS11) lights.	Perform noise suppression circuit	Perform relay sense and K12 operation

Table 6-7. Distribution Box Panel 2A1A2, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
BX(cont)	two seconds, and then to OFF.		card test and troubleshooting procedures, table 6-25.	circuit card test and troubleshooting procedures, table 6-20.
BY	Check A1-10 to GRD then depress RESET button. Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to OFF. Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to OFF. Set TRIGGER switch (S9) to ON. Remove noise suppression circuit card (2A1A2A8). Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to ON. Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to ON. Depress and release RESET pushbutton switch (S19).	+5.0 Vdc 0.0 Vdc		Fig. FO-7, sheet 1.
BZ	At power panel (2A1A3) set +24 VDC ON/OFF switch to ON.			
CA	Set TRIGGER switch (S9) to OFF.			

Table 6-7. Distribution Box Panel 2A1A2, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
	NOTE Wait at least two seconds after setting trigger switch to OFF before performing next step.			
CB	At power panel (2A1A3) set +24 VDC ON/OFF switch to OFF.	K11 indicator (DS10) lights.	Perform noise suppression circuit card test and troubleshooting procedures, table 6-25.	Perform step CC.
CC	Set TEST SYSTEM POWER +5 VDC ON/OFF switch (S15) to OFF.			
	Set TEST SYSTEM POWER +24 VDC ON/OFF switch (S16) to OFF.			
	Remove K11 operation and sequence circuit card (2A1A-2A6) and insert extender board assembly (10554270 or 10554271) into distribution box panel connector (A6).			
	Refer to fig. FO-7, sheet 5, and measure resistance between extender board assembly A6-23 test point and GRD test point (TP3).	Less than 2.5 ohms.	Perform step CD.	Refer to fig. FO-7 sheet 1, and check CLEAR MODE switch (S4-A1) for open condition.
CD	Refer to fig. FO-7, sheets 5 and 2, measure resistance between extender board assembly A6-3 test point and GRD test point	612 to 748 ohms between extender board assembly A6-3 test point and GRD test point (TP3). 3.5k to 4.2k ohms	Perform K11 operation and sequence circuit card test and troubleshooting procedures,	If indication at A6-3 and TEST POINTS 6 is not normal, refer to fig. FO-7, sheet 7 and check

Table 6-7. Distribution Box Panel 2A1A2, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
CD(cont)	(TP3), and between extender board assembly A6-3 test point and distribution box panel TEST POINTS 6.	between extender board assembly A6-3 test point and TEST POINTS 6.	table, 6-23.	RELAY TIME SELECTOR CHANNEL A switch (S17-D2) for open condition. Perform relay sense resistors circuit card test, table 6-19. If indication at A6-3 to GRD is not normal refer to fig. FO-7, sheets 5 and 2.

Table 6-8. Control Panel 2A2A1. Test and Troubleshooting Procedures

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
1	Set all ON/OFF switches on the AN/TSM-100 to OFF and press all circuit breakers.			
2	On power panel (2A1A3), set 115V 400CY 1 PHASE ON/OFF switch to ON, DISTRIBUTION switch to CONT PNL and +24 VDC ON/OFF to ON.	On power panel, 115V 400CY 1 PHASE indicator and DISTRIBUTION +24 VDC indicator light.	Continue test.	Check out power panel (2A1A3) per test procedures table 6-2.
3	On battery charger (2A1A4), set AC-ON switch to ON.	On battery charger, AC indicator lights.	Continue test.	Perform troubleshooting procedures, table 6-3, step C.
4	Observe VOLTS DC meter and AMPERES DC meter on battery charger panel.	AMPERES DC meter indicates a charging current and VOLTS DC meter indicates +27.0 to +27.5 Vdc.	If operating in cold temperatures, refer to table 6-33, for upper voltage charging limit greater than +27.5 Vdc. Continue test.	Adjust MODE VOLTAGE control for +27.5 Vdc on Volts meter. Troubleshoot per table 6-3, step C. Refer to FO-3 and FO-5.
5	On control panel (2A2A1), set POWER ON/OFF switch (S3) to ON.	POWER +24 VDC indicator (DS3) lights.	Continue test.	Check ½ A fuse (F1) and lamp (DS3). Complete step 6. If indication is normal in step 6, POWER ON/OFF switch (S3) is probably defective. Fig. FO-8, sheet 1.

Table 6-8. Control Panel 2A2A1. Test and Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
5 (cont)	On control panel, set POTENTIOMETER SELECT switch S4 to 1. Connect multimeter test lead to TP1 (+) and to TP2 (-) on control panel.	Multimeter indicates +14.96 to +15.04 Vdc (adjust as required at +15 Vdc ADJUST potentiometer R10).	Continue test.	Check A1 component board, S4, and R-10. Replace defective component. Fig. FO-8, sheet 1.
6	On power panel, set DISTRIBUTION rotary switch to +24 VDC ONLY. On control panel, set POWER ON/OFF switch (S3) to OFF. Set SWITCH FUNCTION CHECK switch (S1) to B.	POWER +24 VDC indicator (DS3) on control panel goes out.	Continue test.	Switch S1 or S2 open. Fig. FO-8, sheets 1 and 2.
	Set CONTINUITY CHECK switch (S2) to 7. Connect test probe W286 from +24 VDC control switch test point (TP3) on power panel to test point TP5 on control panel. On power panel set controlled +24 VDC ON/OFF switch to ON.	POWER +24 VDC indicator (DS3) lights.		
	CAUTION Make sure that SWITCH FUNCTION CHECK switch (S1) is set to D prior to setting CONTINUITY CHECK switch (S2) to 9.			

Table 6-8. Control Panel 2A2A1. Test and Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
7	Set SWITCH FUNCTION CHECK switch S1 to D. Set CONTINUITY CHECK switch S2 to 9.	SWITCH FUNCTION CHECK indicator (DS1) lights, while +24 VDC control switch is ON.	Continue test.	Check lamps (DS1). Switch S1 or S2 open. Fig. FO-8, sheets 1 and 2.
8	Set +24 VDC control switch to OFF. Disconnect test probe W286 from TP5 and +24 VDC + test point. Set POTENTIOMETER SELECT switch (S4) to 3. Set SWITCH FUNCTION CHECK switch (S1) to B. Connect test probe W286 from +24 VDC control switch test point on power panel to POTENTIOMETER WIPER test point (TP3). Set +24 VDC control switch on power panel to ON.	SWITCH FUNCTION CHECK indicator (DS1) lights.	Continue test.	Switch S1 or S4 open. Fig. FO-8, sheets 1 and 2.
9	Set POTENTIOMETER SELECT switch (S4) to 4. Set SWITCH FUNCTION CHECK switch (S1) to E.	SWITCH FUNCTION CHECK indicator (DS1) lights.	Continue test.	Switch S1 or S4 open. Fig. FO-8, sheet 1 and 2.
10	Set CONTINUITY CHECK switch (S2) to 8. Set POTENTIOMETER SELECT switch (S4) to 5.	CONTINUITY CHECK indicator DS2 lights.	Continue test.	Check DS2 lamps. Switch S2 or S4 open. Fig. FO-8, sheets 1 and 2.
11	On power panel, set DISTRIBUTION rotary switch to CONT PNL.	POWER +24 VDC indicator (DS3) lights.	Continue test.	Fault isolated in steps 5 and 6 preceding.

Table 6-8. Control Panel 2A2A1. Test and Troubleshooting Procedures - Continued

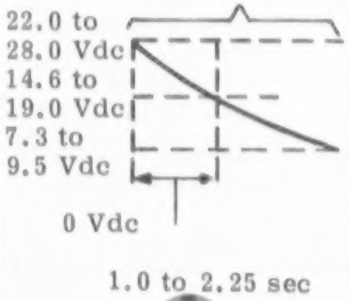
Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
11 (cont)	Using test lead from test lead kit, connect CP36 (1000 ohm resistor) from TP5 test point to GROUND test point on control panel.			
	Connect oscilloscope across CP36 (1000-ohm resistor), with vertical input at TP5.	+22.0 to +28.0 Vdc on oscilloscope.		
	Set POTENTIOMETER SELECT switch (S4) to 7, CONTINUITY CHECK switch (S2) to 7, SWITCH FUNCTION CHECK switch (S1) to B, and POWER +24 VDC ON/OFF switch (S3) to ON.			
12	While observing oscilloscope and POWER +24 VDC indicator (DS3) set POWER +24 VDC ON/OFF to OFF switch S3 ON and OFF as necessary to observe indications.	Oscilloscope indication drops to 0 Vdc in 250 to 100 msec. POWER +24 VDC indicator dims and goes out as voltage drops.	Continue test.	Switch S4D-7 open, or capacitor C1 or resistor R1 defective. Fig. FO-8, sheets 1 and 2.
13	Set CONTINUITY CHECK switch (S2) to 3 and POWER +24 VDC ON/OFF switch to ON.			
	Switch POTENTIOMETER SELECT switch (S4) from 7 to 8 while observing oscilloscope. Repeat switching from 7 to 8 as necessary to observe the indication.	 22.0 to 28.0 Vdc 14.6 to 19.0 Vdc 7.3 to 9.5 Vdc 0 Vdc 1.0 to 2.25 sec	Continue test.	Capacitor C1 or switch S4D-8 is defective. Fig. FO-8, sheets 1 and 2.

Table 6-8. Control Panel 2A2A1. Test and Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
14 (cont)	Set POTENTIOMETER SELECT (S4) to 7. Disconnect CP36 (100-ohm resistor) from TP5 test point and connect oscilloscope, using X1 probe, from TP5 test point (vertical input) to GROUND test point. Rotate POTENTIOMETER SELECT switch (S4) counterclockwise from 7 to 8 pausing at position 6 for 6 seconds, and observe oscilloscope.	Oscilloscope indicates 0.1 Vdc.	Continue test.	Switch S4D-6 or resistor R2 defective. Fig. FO-8, sheets 1 and 2.
15	Disconnect oscilloscope, set POWER +24 VDC ON/OFF switch (S3) to OFF, and set DISTRIBUTION +24 VDC ON/OFF switch on power panel to OFF. Control panel checkout is complete.			

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Table 6-9. Servo Amplifier Panel 2A2A2, and Motor Load Assembly 2A2A4A1 Test Procedures

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
1	Make sure all AN/TSM-100 ON/OFF switches are set to OFF position and all circuit breakers are pressed in.			
2	At power panel (2A1A3), set 115V, 400 CY, 1 PHASE ON/OFF switch and DISTRIBUTION +24 VDC ON/OFF switch to ON. Set DISTRIBUTION switch to SVO AMPL.	At power panel 115V 400-CY 1 PHASE indicator and +24 VDC indicator lights.	Perform power panel test procedures, table 6-2.	
3	At battery charger (2A1A4), set AC-ON switch to ON. Make sure MODE CURRENT ADJUST control is set fully clockwise. Observe VOLTS DC meter and AMPERES DC meter. NOTE All controls and indicators referenced in the following procedures are on the servo amplifier panel (2A2A2) unless otherwise stated.	At battery charger, AC indicator lights, ammeter indicates a charging current, voltmeter indicates a charging voltage between +27.0 to +27.5 Vdc. NOTE If operating in extreme cold temperatures, charging voltage may be set to greater than +27.5 Vdc. Refer to table 6-33 for proper upper limit for charging voltage in extreme cold temperatures.	If VOLTS DC meter indication is greater than upper limit, adjust battery charger MODE VOLTAGE ADJUST control to set proper upper limit voltage value. Perform power panel troubleshooting procedures in table 6-3, step C.	Fig. FO-5, fig. FO-3.

Table 6-9. Servo Amplifier Panel 2A2A2, and Motor Load Assembly 2A2A4A1 Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
4	Set LOAD SELECT switch (S2) to OFF. Set POWER +24 VDC ON/OFF switch (S9) to ON.	+24 VDC indicator (DS2) lights.	Refer to fig. FO-9 and check +24 VDC indicator (DS2) for open condition. If POWER circuit breaker (CB2) opens, perform troubleshooting procedure, table 6-10, step A. If circuit breaker (CB2) does not open, perform troubleshooting procedure, table 6-10, step B.	Fig. FO-9.
5	Set LOAD SELECT switch (S2) alternately to 1/3, 2/3 and FULL.	LOAD ON indicator (DS1) lights at each position.	Refer to fig. FO-9 and check LOAD ON indicator (DS1) for open condition. If POWER circuit breaker (CB2) opens, perform troubleshooting procedure, table 6-10, step D. Refer to fig. FO-9 and check LOAD SELECT switch (S2-A2, A3 and A4) for open condition.	Fig. FO-9, fig. FO-22.
6	Set POWER +24 VDC ON/OFF switch (S9) to OFF. Connect cable W224 between con-	+24 VDC indicator (DS2) and LOAD ON (DS1) indicator go out.		

Table 6-9. Servo Amplifier Panel 2A2A2, and Motor Load Assembly 2A2A4A1 Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
6(cont)	nector pins J21-M and J21-K. Make sure a good electrical connection is made between the pins. Set LOAD SELECT switch (S2) to 1/3. Set TEST SELECT switch (S1) to RADAR MODE. Set DIGITAL VM SELECT switch (S5) to CCW OUPT. CAUTION To prevent damage to the servo amplifier load assembly during steps 7 through 25, the POWER +24 VDC ON/OFF switch (S9) must not be left in the ON position for more than one minute, and must be left in the OFF position for three minutes after being ON for one minute. Turn off power immediately if indication at SERVO LOAD test points is high. Make all connections prior to turning on +24 VDC ON/OFF switch.			

Table 6-9. Servo Amplifier Panel 2A2A2, and Motor Load Assembly 2A2A4A1 Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
	NOTE Leave jumper connection in place for steps 7 through 15. Step 16 contains instructions to remove the jumper connection.			
7	Connect multimeter between SERVO LOAD test points + (TP5) and - (TP6). Set POWER +24 VDC ON/OFF switch (S9) to ON. After observation, set POWER +24 VDC ON/OFF switch (S9) to OFF.	+9 to +13 mVdc. Note also that operation of servo amplifier motor load assembly is audible.	If motor doesn't run, make sure brakes on drive motors are OFF. If SERVO LOAD circuit breaker (CB1) opens, refer to fig. FO-11 and check servo amplifier load motor load assembly motor, B1 and generator, B2, for shorted condition. If POWER circuit breaker (CB2) opens, refer to figs. FO-22 and FO-11 and check servo amplifier load component mounting bracket assembly (2A2A-4A2) Q1 and Q2 transistor network for shorted condition. If abnormal indica-	Fig. FO-9, fig. FO-11, fig. FO-22.

Table 6-9. Servo Amplifier Panel 2A2A2, and Motor Load Assembly 2A2A4A1 Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
7(cont)			tion is greater than 13mV, check motor load assembly (2A2A4A1) motor gears for lubrication (refer to paragraph 2-8, and check servo load assembly motor and generator (B1 and B2) for shorted condition. (Refer to fig. FO-11).	
8	Observe the CAUTION preceding step 7. Connect binding post adapter CP129 to connector J25, with red terminal (+) to left.			
	Set POWER +24 VDC ON/OFF switch (S9) to ON and measure voltage (dc) between CP129 binding post test points.	More positive than +24.0 Vdc.	AN/TSM-100 batteries are not charged. Refer to fig. FO-9 and check DIGITAL VM SELECT switch (S5-A6) for open condition. Refer to paragraph 6-27 for procedures to inspect battery electrolyte. If battery electrolyte level has been set prior to test procedures, per-	Fig. FO-9.

Table 6-9. Servo Amplifier Panel 2A2A2, and Motor Load Assembly 2A2A4A1 Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
8(cont)			form troubleshooting procedures, table 6-10, steps F and H.	
9	Observe the CAUTION preceding step 7. Set POWER +24 VDC ON/OFF switch to ON and measure voltage (dc) between TACH test points + (TP7) and - (TP8).	More negative than -75.0 Vdc.	Perform troubleshooting procedure, table 6-10, step I. Refer to fig. FO-9 and check DIGITAL VM SELECT switch (S5-A6) for open condition.	Fig. FO-9, fig. FO-11.
10	Observe the CAUTION preceding step 7. Set LOAD SELECT switch (S2) to 2/3; set POWER +24 VDC ON/OFF switch (S9) to ON and measure voltage (dc) between SERVO LOAD test points + (TP5) and - (TP6).	+20.0 to +30.0 mVdc.	If SERVO LOAD circuit breaker (CB1) opens, refer to fig. FO-11 and check resistor bracket assembly (2A2A4-A3) resistor R1 and diode CR2 for shorted condition. If POWER circuit breaker (CB2) opens, refer to fig. FO-22 and FO-11, and check component bracket	Fig. FO-22, fig. FO-11.

Table 6-9. Servo Amplifier Panel 2A2A2, and Motor Load Assembly 2A2A4A1 Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
10(cont)			assembly (2A2A4A-2) K1 relay coil and diode CR3 for shorted condition. If abnormal indication is greater than 30.0 mVdc, refer to fig. FO-11 and check resistor bracket assembly (2A2A4A3) diode CR1 for shorted condition. Perform troubleshooting procedures, table 6-10, step J.	
11	Observe the CAUTION preceding step 7.			
	Set POWER +24 VDC ON/OFF switch (S9) to ON and measure voltage (dc) between binding post adapter (connected to J25) test points.	More positive than +20.0 Vdc.	AN/TSM-100 batteries are not charged. Refer to paragraph 6-27 for procedures to inspect battery electrolyte. If battery electrolyte level has been set prior to test procedures, perform troubleshooting procedures, table 6-10, steps F and H.	Fig. FO-9. Refer to fig. FO-9 and check DIGITAL VM SELECT switch (S5-A6) for open condition.

Table 6-9. Servo Amplifier Panel 2A2A2, and Motor Load Assembly 2A2A4A1 Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
12	Observe the CAUTION preceding step 7. Set POWER +24 VDC ON/OFF switch (S9) to ON and measure voltage (dc) between TACH test points +(TP7) and - (TP8).	-41.0 to -49.0 Vdc.	Refer to FO-11 and check motor load assembly tachometer G1 for open condition.	Fig. FO-11, fig. FO-22.
13	Observe the CAUTION preceding step 7. Set LOAD SELECT switch to FULL, set POWER +24 VDC ON/OFF switch (S9) to ON and measure voltage (dc) between SERVO LOAD test points + (TP5) and - (TP6).	+27.0 to +41.0 mVdc.	If SERVO LOAD circuit breaker (CB1) opens, refer to fig. FO-11 and check resistor bracket assembly (2A2A4-A3) resistor R2 for shorted condition. If POWER circuit breaker (CB2) opens, refer to figs. FO-22 and FO-11 and check component bracket assembly (2A2A4 A2) K2 relay coil and diode CR4 for shorted condition. Refer to fig. FO-9, and check LOAD SELECT switch	Fig. FO-9, fig. FO-22, fig. FO-11.

Table 6-9. Servo Amplifier Panel 2A2A2, and Motor Load Assembly 2A2A4A1 Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
13(cont)			(S2-B4 and C4) for open condition. Refer to fig. FO-11 and check component bracket assembly (2A2A4A2) relay coil and contacts (A1 to A2) and resistor bracket assembly (2A2A-4A3) resistor R2 for open condition.	
14	Observe the CAUTION preceding step 7. Set POWER +24 VDC ON/OFF switch (S9) to ON and measure voltage (dc) between binding post adapter (connected to J25) test points.	More positive than +20.0 Vdc.	AN/TSM-100 batteries are not charged. Refer to paragraph 6-27 for procedures to inspect battery electrolyte. If battery electrolyte level has been set prior to test procedures, perform troubleshooting procedures, table 6-10, steps F and H. Refer to fig. FO-9 and check DIGITAL VM SELECT switch (S5-A6) for open condition.	Fig. FO-9.

Table 6-9. Servo Amplifier Panel 2A2A2, and Motor Load Assembly 2A2A4A1 Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
15	Observe the CAUTION preceding step 7. Set POWER +24 VDC ON/OFF switch (S9) to ON and measure voltage (dc) between TACH test points + (TP7) and - (TP8).	-31.0 to -39.0 Vdc.	Refer to fig. FO-11 and check motor load assembly (2A2A4A1) tachometer(G1) for open condition.	Fig. FO-11.
16	Remove jumper cable from J21-K and connect to pin J21-L. Make sure a good electrical connection is made between the pins. Set LOAD SELECT switch (S2) to 1/3. Set DIGITAL VM SELECT switch (S5) to CW OUPT. NOTE Leave jumper connection in place for steps 17 through 26. Step 27 contains instructions to remove the jumper connection.			
17	Observe the CAUTION preceding step 7. Set POWER +24 VDC ON/OFF switch (S9) to ON and measure voltage (dc) between SERVO LOAD test points + (TP5) and - (TP6).	+9.0 to +13.0 mVdc.	If abnormal indication is greater than 13 mV, refer to fig. FO-11 and check motor load assembly (2A2A4A1 motor and	Fig. FO-9, fig. FO-11, fig. FO-22.

Table 6-9. Servo Amplifier Panel 2A2A2, and Motor Load Assembly 2A2A4A1 Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
17(cont)			generator (B1 and B2) for shorted condition. Perform troubleshooting procedure, table 6-10, step K.	
18	Observe the CAUTION preceding step 7. Set POWER +24 VDC ON/OFF switch (S9) to ON and measure voltage (dc) between binding post adapter (connector J25) test points.	More positive than +24.0 Vdc.	Refer to fig. FO-9, and check DIGITAL VM SELECT switch (S5-A6) for open condition. AN/TSM-100 batterries are not charged. Refer to paragraph 6-27 for procedures to inspect battery electrolyte. If battery electrolyte level has been set prior to test procedures, perform troubleshooting procedures, table 6-10, steps F and H.	
19	Observe the CAUTION preceding step 7. Set POWER +24 VDC ON/OFF switch to ON and measure voltage (dc) between TACH	More positive than +75.0 Vdc.	Perform troubleshooting procedure, table 6-10.	

Table 6-9. Servo Amplifier Panel 2A2A2, and Motor Load Assembly 2A2A4A1 Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
19(cont)	test points + (TP7) and - (TP8).		Refer to fig. FO-11 and check motor load assembly (2A2A4A1) tachometer (G1) for open condition. Check DIGITAL VM SELECT switch (S5-A6) for open condition.	Fig. FO-11, fig. FO-9.
20	Observe the CAUTION preceding step 7. Set LOAD SELECT switch (S2) to 2/3; set POWER +24 VDC ON/OFF switch (S9) to ON and measure voltage (dc) between SERVO LOAD test points + (TP5) and - (TP6).	+20.0 to +30.0 mVdc.	If abnormal indication is greater than 30 mV, refer to figure FO-11 and check resistor bracket assembly (2A2A4A3) resistor R3 for shorted condition. Refer to fig. FO-11 and check component bracket assembly (2A2A4A2) K1 relay contacts (B1 to B2), and resistor bracket assembly (2A2A4A3) resistor R3 and diode CR1 for open condition.	Fig. FO-9, fig. FO-11, fig. FO-22.
21	Observe the CAUTION preceding step 7.			

Table 6-9. Servo Amplifier Panel 2A2A2, and Motor Load Assembly 2A2A4A1 Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
21(cont)	Set POWER +24 VDC ON/OFF switch (S9) to ON and measure voltage (dc) between binding post adapter (connected to J25) test points.	More positive than +20.0 Vdc.	AN/TSM-100 batteries are not charged. Refer to paragraph 6-27 for procedures to inspect battery electrolyte. If battery electrolyte level has been set prior to test procedures, perform troubleshooting procedures, table 6-10, steps F and H. Check DIGITAL VM SELECT switch (S5-A6) for open condition.	Fig. FO-9.
22	Observe the CAUTION preceding step 7. Set POWER +24 VDC ON/OFF switch (S9) to ON and measure voltage (dc) between TACH test points + (TP7) and - (TP8).	+40.0 to +50.0 Vdc.	Refer to fig. FO-11 and check motor load assembly (2A2A4A1) tachometer (G1) for open condition. Perform troubleshooting procedure, table 6-10, step I.	Fig. FO-11, fig. FO-9.
23	Observe the CAUTION preceding step 7. Set LOAD SELECT switch (S2) to FULL; set POWER +24	+27.0 to +41.0 mVdc.	If abnormal indication is greater	Fig. FO-9, fig. FO-11, fig. FO-22.

Table 6-9. Servo Amplifier Panel 2A2A2, and Motor Load Assembly 2A2A4A1 Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
23(cont)	VDC ON/OFF switch (S9) to ON and measure voltage (dc) between SERVO LOAD test points + (TP5) and - (TP6).		than 41.0 mV, refer to fig. FO-11 and check resistor bracket assembly (2A2A4A3) resistor R4 for shorted condition. Refer to fig. FO-11 and check components bracket assembly (2A2A4A2) relay contacts (B1 to B2), and resistor bracket assembly (2A2A4-A3) resistor R4 for open condition.	
24	Observe the CAUTION preceding step 7. Set POWER +24 VDC ON/OFF switch (S9) to ON and measure voltage (dc) bebween binding post adapter (connected to J25) test points.	More positive than +20.0 Vdc.	Refer to fig. FO-9, and check DIGITAL VM SELECT switch (S5-A6) for open condition. AN/TSM-100 batteries are not charged. Refer to paragraph 6-27 for procedures to inspect battery electrolyte. If battery electrolyte level has been set prior to test procedures, perform trouble-	Fig. FO-9, fig. FO-22.

Table 6-9. Servo Amplifier Panel 2A2A2, and Motor Load Assembly 2A2A4A1 Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
24(cont)			shooting procedures, table 6-10, steps F and H. Perform troubleshooting procedures, table 6-10, step I.	
25	Observe the CAUTION preceding step 7. Set POWER +24 VDC ON/OFF switch (S9) to ON and measure voltage (dc) between TACH test points + (TP7) and - (TP8).	+30.0 to +40.0 Vdc.	Refer to fig. FO-11 and check motor load assembly (2A2A4A1) tachometer (G1) for open condition. Perform trouble shooting procedure, table 6-10, step I.	Fig. FO-11
26	Set POWER +24 VDC On/OFF switch (S9) to OFF. Set LOAD SELECT switch (S2) to OFF.	+24.0 VDC indicator (DS2) goes out. LOAD ON indicator (DS1) goes out.		
27	Remove cable W224 from between J21-M and J21-L. Test complete.			

Table 6-10. Servo Amplifier Panel 2A2A2 and Motor Load Assembly 2A24A1, Troubleshooting Procedures

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
A	Set POWER +24 VDC ON/OFF switch (S9) to OFF. Remove servo amplifier circuit card (2A2A2A1). Set POWER circuit breaker (CB2) in. Set POWER +24 VDC ON/OFF switch (S9) to ON.	Power circuit breaker (CB2) remains in.	Perform servo amplifier circuit card test and troubleshooting procedures, table 6-26. Refer to figs. FO-22 and FO-11 and check component bracket assembly (2A2A4A2). Q1 and Q2 transistor network for shorted condition.	Refer to fig. FO-9, and check servo amplifier panel wiring from POWER circuit breaker (CB2-2) to ground for shorted condition.
B	Set POWER +24 VDC ON/OFF switch (S9) to OFF. Remove servo amplifier circuit card. Set POWER +24 VDC ON/OFF switch (S9) to ON.	+24 VDC indicator (DS2) lights.	Perform servo amplifier circuit card test and troubleshooting procedures, table 6-26.	Perform step C.
C	Set POWER +24 VDC ON/OFF switch (S9) to OFF. Refer to fig. FO-9, and measure voltage (dc) between POWER +24 VDC switch S9-C1 and GROUND test point (TP4).	+23.0 to +28.0 Vdc.	Refer to fig. FO-9 and check POWER +24 VDC switch (S9) for open condition. Check K2 relay coil for shorted condition.	Perform power panel (2A1A3) test, table 6-2.

Table 6-10. Servo Amplifier Panel 2A2A2 and Motor Load Assembly 2A2A4A1, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
D	Refer to fig. FO-9 and measure voltage (dc) between POWER circuit breaker (CB2-2) and GROUND test point (TP4).	+23.0 to +28.0 Vdc.	Check SERVO LOAD SELECT switch (S2) for open condition. Perform step E.	Check K2 relay coil and contacts (A1 to A2) for open condition. Check POWER circuit breaker (CB2) for open condition.
E	Set LOAD SELECT switch (S2) to OFF. Set POWER +24 VDC ON/OFF switch (S9) to OFF. Remove servo amplifier circuit card. Set POWER circuit breaker (CB2) in.			
	Set POWER +24 VDC ON/OFF switch (S9) to ON.	Power circuit breaker (CB2) remains in.		
	Set LOAD SELECT switch (S2) to 1/3.	LOAD ON indicator (DS1) lights.	Perform servo amplifier circuit card test and troubleshooting procedures, table 6-26.	Refer to fig. FO-9 and check K1 relay coil for shorted condition.
	CAUTION To prevent damage to the servo amplifier load assembly during steps G through K, the POWER +24 VDC ON/OFF switch (S9) must not be left in the ON position for more than one minute, and must be left in the off position for three			

Table 6-10. Servo Amplifier Panel 2A2A2 and Motor Load Assembly 2A2A4A1, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
E(cont)	minutes after being ON for one minute. Turn off power immediately if indication at SERVO LOAD test points is high.			
F	Measure voltage (dc) between binding post adapter (connected to J25) test points.	More positive than +24.0 Vdc.	If operation of servo load assembly is not audible, perform step G. If operation of servo load assembly is audible, refer to fig. FO-11, and check servo amplifier load assembly generator B2 for open condition, and component mounting bracket (A2) Q1 and Q2 transistor network for defective components.	If indication is 0 Vdc, refer to fig. FO-9 and check SERVO LOAD circuit breaker (CB1), SERVO LOAD shunt (R4), and DIGITAL VM SELECT switch (S5-A5) for open condition. If indication is less than 24 Vdc, AN/TSM-100 batteries are not charged and probably need electrolyte. Refer to paragraph 6-27 for procedures to inspect battery electrolyte.
G	Set POWER +24 VDC ON/OFF switch (S9) to OFF. Remove inverter/converter test panel (2A2A4) connectors. Remove inverter, converter test panel (2A2A4).			

Table 6-10. Servo Amplifier Panel 2A2A2 and Motor Load Assembly 2A2A4A1, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
G(cont)	Disconnect inverter/converter chassis P117 and J117 connectors. Observe CAUTION in preceding step F.			
	Set POWER +24 VDC ON/OFF switch (S9) to ON and measure voltage (dc) between P117-K (+) and P117-L (-) connector pins.	+22.0 to +28.0 Vdc.	Refer to fig. FO-11 and check motor B1 for open condition.	Refer to fig. FO-9 and check K1 relay coil and contacts (A1 to A2) for open condition.
H	Charge AN/TSM-100 batteries as follows: At power panel (2A1A3) set DISTRIBUTION +24 VDC ON/OFF switch (S2) to OFF.			
	At battery charger (2A1A4) observe AMPERES DC meter as batteries are charging. When indication of 5 A or less is obtained, batteries can be considered fully charged.	5 A or less.	Set power panel (2A1A3) DISTRIBUTION +24 VDC switch to ON, repeat checkout test procedure, table 6-9, and continue.	If batteries indicate abnormal charge after being charged and checked under load again. Refer to paragraph 6-27 and inspect batteries for proper electrolyte level and damage.
I	Set POWER +24 VDC ON/OFF switch (S9) to OFF. Remove servo amplifier circuit card (2A2A2A1). Observe CAUTION preceding step F.			
	Set POWER +24 VDC ON/OFF switch (S9) to ON; and measure voltage (dc) be-	More negative than -75.0 Vdc.	Perform servo amplifier circuit card (2A2A2A1) test	Refer to fig. FO-11 and check inverter/converter chassis

Table 6-10. Servo Amplifier Panel 2A2A2 and Motor Load Assembly 2A2A4A1, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
I(cont)	tween TACH test points + (TP7) and - (TP8).		and troubleshooting procedures, table 6-26.	assembly (2A2A-4A1) tachometer G1, for open condition.
J	Observe CAUTION preceding step F. Set LOAD SELECT switch (S2) to FULL and measure voltage (dc) between SERVO LOAD test points + (TP5) and - (TP6).	+32.0 to +39.0 mV.	Refer to fig. FO-9 and check LOAD SELECT switch (S2-B3) for open condition.	If indication is the same as abnormal indication in table 6-9, step 10, refer to fig. FO-11 and check amplifier resistor bracket assembly (2A2A4A3) diode CR2 for open condition. Refer to fig. FO-11 and check component bracket assembly (2A2A4A2) K1 relay coil and contacts (A1 and A2), and resistor bracket assembly (2A2A4A3) resistor R1 for open condition.
K	Set POWER +24 VDC ON/OFF switch (S9) to OFF. Remove inverter/converter test panel (2A2A4). Disconnect inverter/converter chassis P117 and J114 connectors. Observe CAUTION preceding step H.			

Table 6-10. Servo Amplifier Panel 2A2A2 and Motor Load Assembly 2A2A4A1, Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
K(cont)	Set POWER +24 VDC ON/OFF switch (S9) to ON, and measure voltage (dc) between P117-J (+) and P117-L (-) connector pins.	+22.0 to +28.0 Vdc.	Refer to fig. FO-11 and check motor B1 for open condition.	Refer to fig. FO-9 and check K1 relay contacts (B1 and B2) for open condition.

Table 6-11. SCG Servo Test Panel 2A2A6 Test Procedure

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
1.	Make sure all AN/TSM-100 ON/OFF switches are set to OFF position and all circuit breakers are set in.			
2.	At AN/TPM-22 Radar Test Set (UNIT 1) power supply (1A1A4), set TEST MODE switch to RCVR/XMTR.			
3.	At power panel (2A1A3), set 115V 400CY 1 PHASE ON/OFF switch and DISTRIBUTION +24VDC ON/OFF switch to ON. Set DISTRIBUTION switch to RADAR NOISE position.	Power panel 115V 400 CY 1 PHASE, +24VDC, INVERTER, and Unit 1 indicators light. On AN/TPM-22 Radar Test Set POWER ON/OFF pushbutton indicator illuminates on MX-8046A.	Perform power panel test procedures, table 6-2.	
4.	At battery charger (2A1A4), set AC ON switch to ON.	Battery charger AC indicator lights.		
5.	Battery charger (2A1A4): Make sure that MODE CURRENT ADJUST control is set fully clockwise. Observe VOLTS DC meter and AMPERES DC METER.	Battery charger indicates a charging current, and voltmeter indicates a charging voltage between +27.0 and +27.5 Vdc.	If VOLTS DC meter indication is greater than upper limit, adjust battery charger MODE VOLTAGE ADJUST control to set charging voltage to its upper limit value.	

Table 6-11. SCG Servo Test Panel 2A2A6 Test Procedure - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
		NOTE If operating in extreme cold temperatures, charging voltage may be set to greater than +27.5 Vdc. Refer to table 6-27 for proper upper limit for charging voltage in extreme temperatures.	Perform power panel test procedures, table 6-2.	
6.	On SCG servo test panel (2A2A6) set RANGE RATE MAN/AUTO switch to AUTO. RANGE MAN/AUTO switch to AUTO. Measure dc voltage between 24 VDC test point and GND 1 test point.	+22.0 to +28.0 Vdc.	Check internal cable assembly W204. Perform sight current panel (2A1A1) test procedure, table 6-4.	Fig. FO-6, sheet 1. Fig. FO-10, sheet 2. Repair or replace cable assembly W204.
7.	Set POWER ON/OFF switch to ON.	CIRCUIT BREAKER (CB1) on sight current generator panel (2A1A1) remains in.	If CIRCUIT BREAKER (CB1) opens, perform troubleshooting procedures, table 6-12, step A.	

Table 6-11. SCG Servo Test Panel 2A2A6 Test Procedure - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
8.	Set SYNCHRO ON/OFF switch to ON. Measure ac voltage between R1 (TP14) and R2 (TP13).	103.5 to 126.5 Vac.	Perform sight current generator panel test procedures, table 6-4. Perform troubleshooting table 6-12, step B.	Figs. FO-6 and FO-10, sheet 2.
	Measure voltage (ac) between: Test point S1 (TP15) and Test Point S2 (TP16). Test Point S2 and Test point S3 (TP17).	73 to 83 Vac.	Replace SYN 1.	
9.	Set TP9 thumbwheel switch to 6. Measure voltage (dc) between TP9 and GND 1.	+14.25 to +15.75 Vdc.	Perform troubleshooting table 6-12, step D.	Fig. FO-10, sheet 2.
10.	Set TP9 thumbwheel switch to 9. Measure voltage (dc) between TP9 and GND 1.	+4.75 to +5.25 Vdc.	Perform troubleshooting table 6-12, step E.	Fig. FO-10, sheet 3.
11.	Set TP9 thumbwheel switch to 10.	-23.75 to -26.25 Vdc.	Perform troubleshooting table 6-12, step F.	Fig. FO-10, sheet 2.
12.	Set TP9 thumbwheel switch to 11.	+23.75 to +26.25 Vdc.	Perform troubleshooting table 6-12, step G.	Fig. FO-10, sheet 2.
13.	Set TP9 thumbwheel switch to 12.	-14.25 to -15.75 Vdc.	Perform troubleshooting table 6-12, step H.	Fig. FO-10, sheet 2.

Table 6-11. SCG Servo Test Panel 2A2A6 Test Procedure - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
14.	Set TP9 thumbwheel switch to 2. Set UUT PS-1 ON/OFF switch to ON. Measure voltage (ac) between UUT VAR test point and TP9.	103.5 to 126.5 Vac.	Perform troubleshooting table 6-12, step L.	Table 6-12, step L. Fig. FO-10, sheet 3.
15.	Set TP9 thumbwheel switch to 0 then to 1. Measure voltage (ac) between TP9 and TP10. Set TP10 thumbwheel switch to 6.	24.0 to 28.0 Vac.	Perform troubleshooting table 6-12, step M.	Fig. FO-10, sheet 3.
16.	Set TP9 thumbwheel switch to 7. Set RANGE REF switch to 20 VDC and UUT PS-2 to ON. Measure voltage (dc) between test points TP9 and GND 1.	+19.80 to +20.20 Vdc.	Perform troubleshooting table 6-28, step 21.	Fig. FO-10, sheet 3.
17.	Set TP9 thumbwheel switch to 5.	+19.80 to +20.20 Vdc.	Perform troubleshooting table 6-12, step J.	Fig. FO-10, sheet 1.
18.	Set RANGE REF switch to 12 VDC. Using test lead from test lead kit connect CP36 between TP9 and GND 2.	+11.40 to +12.60 Vdc.	Perform troubleshooting table 6-12, step K.	Fig. FO-10, sheet 1.

Table 6-11. SCG Servo Test Panel 2A2A6 Test Procedure - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
19.	Remove CP36 from TP9 and GND 2. Measure voltage (dc) between test points TP10 and GND 1. Set TP10 to the following positions:		Perform test and troubleshooting procedure table 6-29.	Fig. FO-10, sheet 3
	TP10-0	+14.25 to +15.75 Vdc.		Fig. FO-25.
	TP10-1	-9.97 to -10.03 Vdc.		
	TP10-2	+9.97 to +10.03 Vdc.		
	NOTE Turn RANGE RATE or RANGE switches off after each measurement for the following steps: 20, 21, 22 and 23.			
20.	Set RANGE and RANGE RATE switches to MAN. Measure voltage (dc) between TP11 and GND 1. Set TP11 thumbwheel switch and RANGE RATE indicator switches to the following positions: TP11 Range Rate		For TP11-0, 1, 6 perform troubleshooting procedures table 6-12, step D. For TP11-7 through 15 perform troubleshooting procedures table 6-12, step E.	Fig. FO-10, sheet 3. Fig. FO-10, sheet 1.
	0	+14.25 to +15.75 Vdc.		
	1	+14.25 to +15.75 Vdc.		
	6	+14.25 to +15.75 Vdc.		
	7 $\overline{\text{SIGN}}$ ON	+4.75 to +5.25 Vdc.		
	8 SIGN ON	+4.75 to +5.25 Vdc.		
	9 160 M/S	+4.75 to +5.25 Vdc.		
	10 80 M/S	+4.75 to +5.25 Vdc.		
	11 40 M/S	+4.75 to +5.25 Vdc.		
	12 20 M/S	+4.75 to +5.25 Vdc.		

Table 6-11. SCG Servo Test Panel 2A2A6 Test Procedure - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
20. (cont)	13 10 M/S	+4.75 to +5.25 Vdc.		
	14 5 M/S	+4.75 to +5.25 Vdc.		
	15 2.5 M/S	+4.75 to +5.25 Vdc.		
21.	Measure voltage (dc) between TP12 and GND 1. Set TP12 thumbwheel switch and RANGE indicator switch to the following positions:		For TP12-0,2,3, and 5 perform table 6-12, step D.	Table 6-12, step D. Fig. FO-10, sheet 3.
	TP12 Range		For TP12-6 through 15, perform table 6-12, step E.	Fig. FO-10, sheet 1.
	0	+14.25 to +15.75 Vdc.		
	2	+14.25 to +15.75 Vdc.		
	3	+14.25 to +15.75 Vdc.		
	5	+14.25 to +15.75 Vdc.		
	6 5M	+4.75 to +5.25 Vdc.		
	7 10M	+4.75 to +5.25 Vdc.		
	8 20M	+4.75 to +5.25 Vdc.		
	9 40M	+4.75 to +5.25 Vdc.		
	10 80M	+4.75 to +5.25 Vdc.		
	11 160M	+4.75 to +5.25 Vdc.		
	12 320M	+4.75 to +5.25 Vdc.		
	13 640M	+4.75 to +5.25 Vdc.		
	14 1280M	+4.75 to +5.25 Vdc.		
	15 2560M	+4.75 to +5.25 Vdc.		
22.	Set TP12 thumbwheel switch to 1. Set RANGE MAN/AUTO switch to MAN. Measure voltage (dc) between TP12 and GND 1 test point.	The indicating light above the switch set to ON will light.	Perform trouble-shooting table 6-12, step N.	

Table 6-11. SCG Servo Test Panel 2A2A6 Test Procedure - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
22. (cont)	Set the following RANGE switches to ON when making voltage measurements and then to OFF.			
	5M	+0.000V to +0.060 Vdc.		
	10M	+0.020 to +0.080 Vdc.		
	20M	+0.040 to +0.120 Vdc.		
	40M	+0.120 to +0.200 Vdc.		
	80M	+0.280 to +0.360 Vdc.		
	160M	+0.600 to +0.680 Vdc.		
	320M	+1.240 to +1.320 Vdc.		
	640M	+2.520 to +2.600 Vdc.		
	1280M	+5.04 to +5.20 Vdc.		
	2560M	+10.140 to +10.340 Vdc.		
23.	Set TP9 thumbwheel switch to 8. Set RANGE RATE MAN/AUTO switch to MAN. Measure voltage (dc) between TP9 and GND 1 test point.		Perform troubleshooting table 6-12, step O.	Fig. FO-10, sheet 1.
	Set following RANGE RATE switches to ON when making voltage measurements and then to OFF.	The indicating light above the switch set to ON will light.		
	$\overline{\text{SIGN}}$	-9.95 to -10.05 Vdc.		
	SIGN	+0.000 to +0.0060 Vdc.		
	160 M/S	+4.990 to +5.090 Vdc.		
	80 M/S	+2.470 to +2.560 Vdc.		
	40 M/S	+1.210 to +1.310 Vdc.		
	20 M/S	+0.580 to +0.680 Vdc.		
	10 M/S	+0.265 to +0.365 Vdc.		
	5 M/S	+0.107 to +0.207 Vdc.		
	2.5 M/S	+0.028 to +0.128 Vdc.		

Table 6-11. SCG Servo Test Panel 2A2A6 Test Procedure - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
24.	Set RANGE RATE MAN/AUTO switch to AUTO. Set RANGE MAN/AUTO switch to AUTO. Set UUT PS-1 ON/OFF switch to ON. Set UUT PS-2 ON/OFF switch to ON. Set TARGET DIRECTION IN/OUT switch to OUT. At SCG test panel set MANUAL/AUTO switch to AUTO. Set POWER switch to ON.			
	At SCG servo test panel press RANGE START switch.	RANGE lights will light in sequence from 5M to 2560M then from 2560M to 5M.	Perform troubleshooting procedures table 6-12, step P.	Table 6-12, step P.
25.	Press RANGE RATE START switch.	RANGE RATE lights will light in sequence from 2.5 M/S to $\overline{\text{SIGN}}$ then from $\overline{\text{SIGN}}$ to 2.5 M/S.	Perform troubleshooting procedures table 6-12, step Q.	Table 6-12, step Q.
26.	Connect chart recorder CHANNEL 1 between TP15 and GROUND test point and CHANNEL 2 between TP14 on SCG test panel and GROUND using test lead kit. Set chart recorder LINE ON/OFF switch to ON. Set MARKER TIME/MARKER switch to 1 SEC. Press CHART SPEED 5 mm/sec switch.			

Table 6-11. SCG Servo Test Panel 2A2A6 Test Procedure - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
26. (cont)	Adjust CHANNEL 1 pen to trace on extreme right hand line. Adjust CHANNEL 2 pen to trace on center line of chart.			
	At SCG servo test panel press RANGE AND RANGE RATE pushbutton.	Refer to fig. 6-1 for chart recorder indication.	Perform troubleshooting procedures table 6-12, step R.	Table 6-12, step R.
27.	Set TARGET DIRECTION IN/OUT switch to IN.	Refer to fig. 6-2 for chart recorder indication.	Perform troubleshooting procedures table 6-12, step S.	Table 6-12, step S.
	At SCG servo test panel press RANGE AND RANGE RATE pushbutton.	RANGE lights will light in sequence from 2560M to 5M then from 5M to 2560M.	Perform troubleshooting procedures table 6-12, step T.	
	After all RANGE and RANGE RATE lights go out press CHART SPEED STOP pushbutton.	RANGE RATE lights will light in sequence from SIGN to 2.5 M/S then from 2.5 M/S to SIGN.	Perform troubleshooting procedures table 6-12, step T.	
28.	On SIGHT CURRENT GENERATOR panel set POWER switch to OFF. Disconnect chart recorder.			

Table 6-11. SCG Servo Test Panel 2A2A6 Test Procedure - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
28. (cont)	CAUTION In the following tests the Power Meter HP 435B and the Power Sensor HP 8481A will be used. Extreme care should be used when handling the power sensor. Avoid dropping or hitting the power sensor, for this will destroy the sensor match between the meter and the mount causing meter reading drift, particularly on the lower scales of the power meter. Excessive input power will permanently damage the power sensor, resulting in excessive drift or zero shift and an incorrect power reading.			
29.	Set up power meter, turn on and allow 5 minutes warmup time. Zero the power meter as follows: Set the RANGE control to COARSE ZERO position. Adjust the COARSE ZERO screw to set power meter pointer on zero mark on the left side of the power meter.			

Table 6-11. SCG Servo Test Panel 2A2A6 Test Procedure - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
29 (cont)	Set the RANGE control to +10 dBm position and depress the FINE ZERO switch momentarily. CAUTION The power meter RANGE switch should always be set on the highest power level before connecting the power sensor to make a measurement; then reduced as necessary to obtain an "on-scale" reading. This precaution will prevent damage to the power sensor.			
	Connect cable W82 to TRANSMIT PULSE OUT jack on MX-8046A panel of AN/TPM-22 Radar Test Set. Connect power meter 435B to other end of cable W82 using adapter CP41 (N TYPE). On AN/TPM-22 Radar Test Set MX-8046A panel adjust ATTENUATOR for 50 dB. Set CHANNEL SELECTOR to 1. On power supply PP-6324 depress +24VDC indicator pushbutton to illuminate ON legend.	-20 dB	Check MX-8046A panel.	Refer to AN/TPM-22 Radar Test set (UNIT 1) manual test procedure MX-8046A.

Table 6-11. SCG Servo Test Panel 2A2A6 Test Procedure - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
29. (cont)	On MX-8046A panel depress POWER pushbutton indicator to illuminate ON legend. On the MX-8046A test panel set NOISE FIGURE illumination OFF, STALO ON/OFF to ON. EXTERNAL/INTERNAL to INTERNAL and MOD MODE SW to ON position. NOTE Power output of some MX-8046A panels may vary. It may be necessary to use ATS-1 Precision Attenuator set to obtain -20 dB output. Adjust ATTENUATOR to obtain -20 dB power output on power meter. CAUTION To prevent damage to connectors connect to AMP 1 and 2 OUT jacks with care. Remove AT1 from AMP 1 OUT.			

Table 6-11. SCG Servo Test Panel 2A2A6 Test Procedure - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
30.	Disconnect cable W82 from power meter and connect W82 to AMP 1-IN jack on SCG servo test panel (2A2A6). Connect power meter to AMP 1 OUT jack using CP120. Set AMP switch to ON. Measure amplifier 1 power output.	0 dBm to +10 dBm (20 dB to 30 dB gain).	Check amplifier 1. Perform troubleshooting procedures, table 6-12, step T.	Fig. FO-10, sheet 3.
31.	On MX-8046A panel rotate CHANNEL SELECTOR switch to each of its positions and measure power output of amplifier 1.	0 dBm to +10 dBm.		
32.	Set AMPL switch to OFF. Disconnect power meter from AMP 1 OUT jack and connect to AMP 2 OUT jack. Disconnect cable W82 from AMP 1 IN jack and connect to AMP 2 IN jack. Set AMPL switch to ON and measure amplifier 2 power output. Repeat step 31 for amplifier 2. Set AMPL switch to OFF.			
33.	Disconnect equipment and replace AT1 to AMP 1 OUT jack and AT2 to AMP 2 OUT jack.			
34.	Connect multimeter to TRIG CHAN A jack of SCG SERVO TEST PANEL using adapter CP 129.			

Table 6-11. SCG Servo Test Panel 2A2A6 Test Procedure - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
35.	Set POWER switch of counter to ON. Set CHANNEL A and CHANNEL B switches to PRESET.	0 volts.	Check cables using Time Domain Reflectometer 1502. Refer to TM 9-6625-2801-14& P. Replace counter.	Instruction manual for counter.
36.	Rotate CHANNEL A LEVEL control slowly to maximum clockwise position.	Voltage varies from approximately -1.37 to +1.37 volts dc.	Perform troubleshooting procedure, table 6-12, step V.	
37.	Connect adapter CP 129 to TRIG CHAN B. Repeat step 36 for CHANNEL B.		Perform troubleshooting procedures, table 6-12, step W.	
38.	Connect multimeter between center contact of J14 and AUDIO INPUT jack pin A and measure resistance.	Less than 1.0 ohm.	Check wiring J14 and AUDIO INPUT jack.	Fig. FO-10.
39.	Connect multimeter black lead to GND 1 and red lead AUDIO INPUT jack pin E.	Less than 1.0 ohm.	Check wiring at pin E.	Fig. FO-10.
40.	Connect multimeter red lead to AUDIO INPUT jack pin B.			
	Set PULSE/CW switch to PULSE.	Infinity	Check switch S32.	Fig. FO-10.
	Set PULSE/CW switch to CW.	Less than 1.0 ohm.		
	TEST COMPLETE			

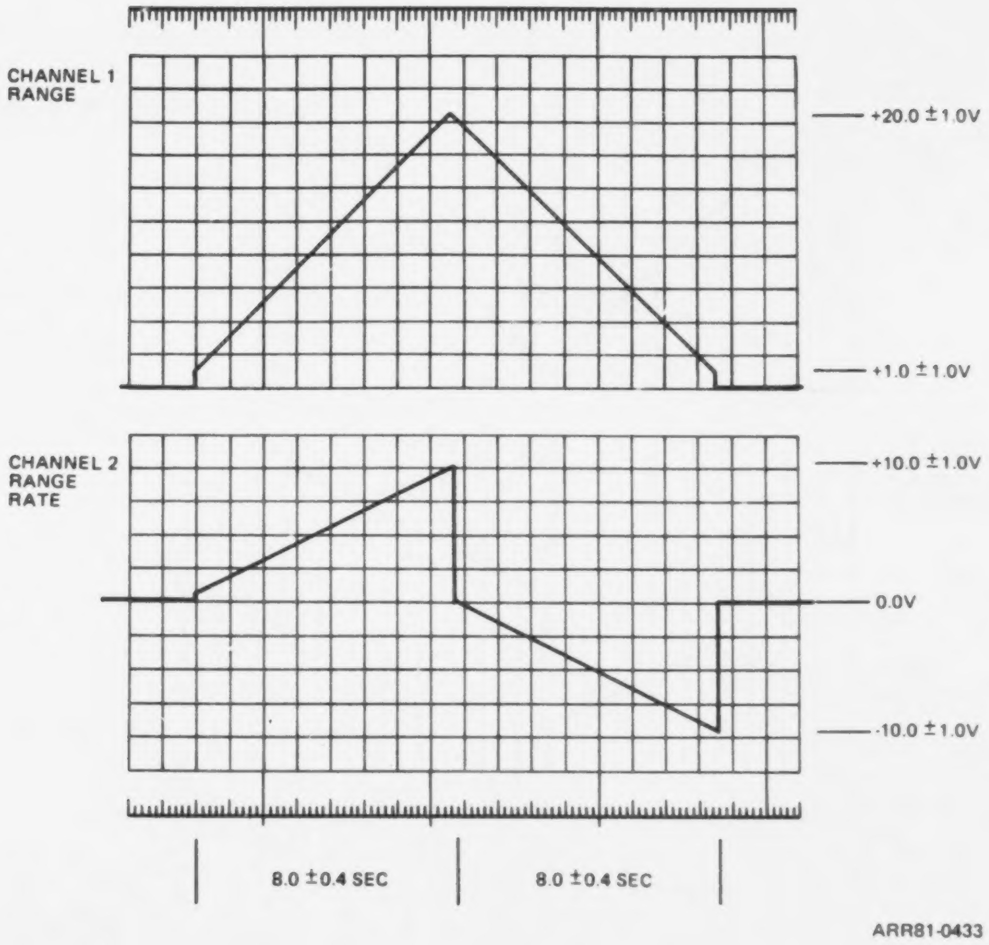

Figure 6-1. Range and range rate outbound.

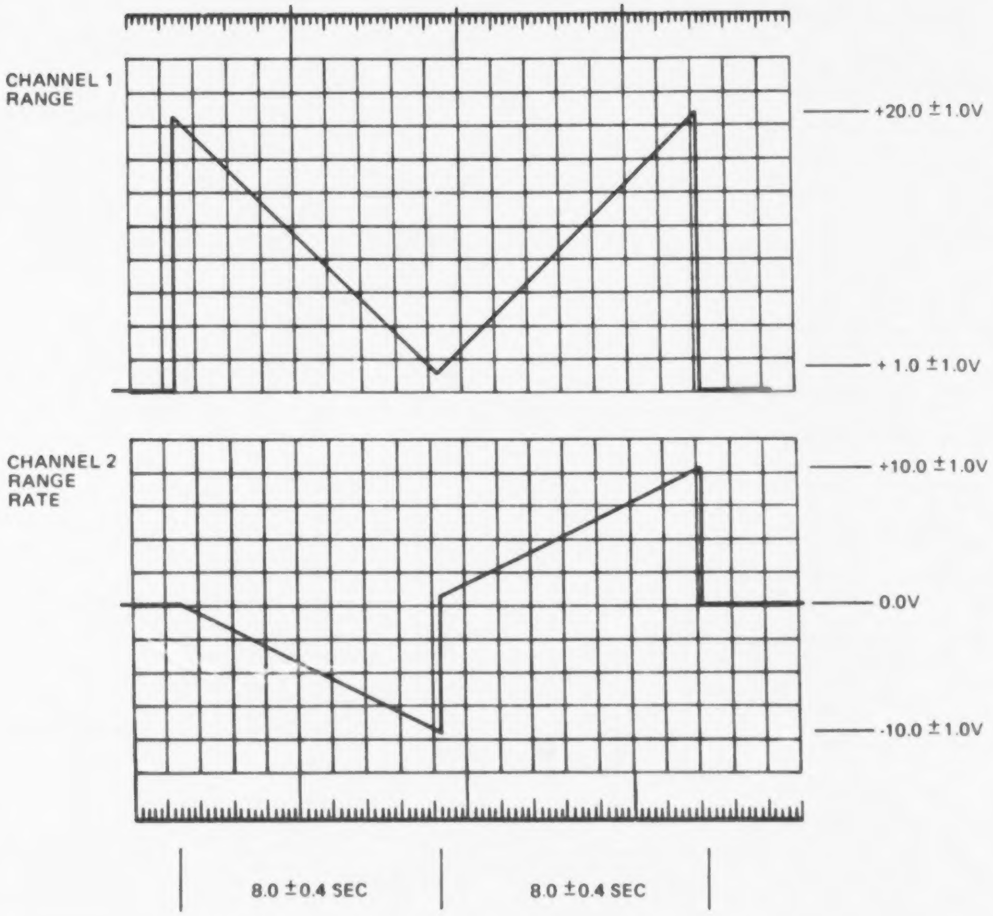

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Figure 6-2. Range and range rate inbound.

Table 6-12. SCG Servo Test Panel 2A2A6 Troubleshooting Procedures

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
A.	Remove SCG servo test panel circuit cards (2A2A6A1, 2A2A6A2, and 2A2A6A3). Set CIRCUIT BREAKER (CB1) in.	CIRCUIT BREAKER (CB1) remains in.	Perform test and troubleshooting procedures for SCG servo test panel circuit cards, tables 6-27, 6-28, and 6-29.	Refer to figs. FO-6 and FO-10, sheet 1. Check relays K1 and K2 for shorted conditions. Replace if defective.
B.	Refer to fig. FO-10. Measure voltage (ac) between test points R1 (TP14) and R2 (TP13).	103.5 to 126.5 Vac.	Perform step C.	Check switch S4 and relay K2.
C.	Refer to fig. FO-10. Measure voltage (dc) between CR1 cathode and GND 1.	+23.0 to +28.0 Vdc.	Check switch S25.	Refer to fig. FO-10, sheet 2. Check S4, K2, and S25 for open condition.
D.	Refer to fig. FO-10. Measure voltage (dc) between terminals 3(+) and 4(-) of PS-2.	+14.25 to +15.75 Vdc.	Check TP9 thumbwheel switch and relay K2.	Refer to fig. FO-10, sheet 2. Adjust PS-2 for +15 Vdc. Replace PS-2 if it cannot be adjusted.
E.	Refer to fig. FO-10. Measure voltage (dc) between terminals 3(+) and 4(-) of PS-1.	+4.75 to +5.25 Vdc.	Check TP9 thumbwheel switch and relay K2.	Refer to fig. FO-10, sheet 2. Adjust PS-1 for +5.0 Vdc. Replace PS-1 if adjustment cannot be made.

Table 6-12. SCG Servo Test Panel 2A2A6 Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
F.	Refer to fig. FO-10. Measure voltage (dc) between terminals 3(+) and 4(-) of PS-5.	-23.75 to -26.25 Vdc.	Check TP9 thumbwheel switch and relay K2.	Refer to fig. FO-10, sheet 2. Adjust PS-5 for -25.0 Vdc. Replace PS-5 if adjustment cannot be made.
G.	Refer to fig. FO-10. Measure voltage (dc) between terminals 3(+) and 4(-) of PS-4.	+23.75 to +26.25 Vdc.	Check TP9 thumbwheel switch and relay K2.	Refer to fig. FO-10, sheet 2. Adjust PS-4 for +25.0 Vdc. Replace PS-4 if adjustment cannot be made.
H.	Refer to fig. FO-10. Measure voltage (dc) between terminals 3(+) and 4(-) of PS-3.	-14.25 to -15.75 Vdc.	Check TP9 thumbwheel switch and relay K2.	Refer to fig. FO-10, sheet 2. Adjust PS-3 for -15 Vdc. Replace PS-3 if adjustment cannot be made.
I.	Refer to fig. FO-10. Measure voltage (ac) between test points AC-RT and ACV.	103.5 to 126.5 Vac.	Check relay K2.	Refer to fig. FO-10, sheet 2. Check K2. Check S25 and power panel 2A1A3.
J.	Measure voltage (dc) between connector TP9-7 and GND 1 test point.	+19.80 and +20.20 Vdc.	Continue testing.	Refer to fig. FO-10 and FO-24, sheet 1. Check switch S3. Perform fault isolation procedures for table 6-28 for circuit card 2A2A6A2.

Table 6-12. SCG Servo Test Panel 2A2A6 Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
K.	Measure voltage (dc) between connector TP9-5 and GND 1 test point.	+11.4 to +12.6 Vdc.	Continue testing.	Refer to figs. FO-10, sheet 1 and FO-23. Check resistors TB4 R1 and R2 of SCG SERVO test panel and CR1, Q1, and R12 of circuit card 2A2A6A1.
L.	Measure voltage (ac) between terminals 1 and 2 of transformer T1.	103.5 to 126.5 Vac.	Check switch S24.	Refer to fig. FO-10, sheet 3. Check K1, and check power panel. Replace defective components.
M.	Measure voltage (ac) between terminals 3 and 4, and terminals 4 and 5 of transformer T1.	24.0 to 28.0 Vac.	Check switch S24.	Refer to fig. FO-10, sheet 3. Check T1. Replace if defective.
N.	Refer to fig. FO-10. Set TP12 thumbwheel switch to 1. Set RANGE MAN/AUTO switch to MAN. Measure voltage (dc) between TP12 and GND 1 test point. Set following RANGE switches to ON when making voltage measurements and then to OFF.	Refer to table 6-11, step 22 for voltages.	Check switch S2. Check lamp and amplifier for indicators that do not light. (DS10 through DS19). Perform test for SCG Servo test panel circuit cards (2A2A6A1, 2A2A6A2, and 2A2A6A3) tables 6-27, 6-28, and 6-29.	
	5M	+0.000V to +0.060 Vdc.		
	10M	+0.020 to +0.080 Vdc.		
	20M	+0.040 to +0.120 Vdc.		
	40M	+0.120 to +0.200 Vdc.		
	80M	+0.280 to +0.360 Vdc.		

Table 6-12. SCG Servo Test Panel 2A2A6 Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
N. (cont)	160M	+0.600 to +0.680 Vdc.		
	320M	+1.240 to +1.320 Vdc.		
	640M	+2.520 to +2.600 Vdc.		
	1280M	+5.070 to +5.170 Vdc.		
	2560M	+10.140 to +10.340 Vdc.		
O.	Refer to fig. FO-10, sheet 1. Set TP9 thumbwheel switch to 8. Set RANGE RATE MAN/AUTO switch to MAN. Measure voltage (dc) between TP9 and GND 1 test point. Set following RANGE RATE switch to ON when making voltage measurements and then to OFF.		Check lamp and amplifier for indicators that do not light (DS1 through DS9). Perform test for SCG servo test panel circuit cards (2A2A6A1, 2A2A6A2, and 2A2A6A3) tables 6-27, 6-28, and 6-29.	Refer to fig. FO-10, sheet 1. Check switches S2, and S14 through S23 for continuity.
	$\overline{\text{SIGN}}$	-9.95 to -10.05 Vdc.		
	SIGN	+0.000 to +0.0060 Vdc.		
	160 M/S	+4.990 to +5.090 Vdc.		
	80 M/S	+2.470 to +2.570 Vdc.		
	40 M/S	+1.210 to +1.310 Vdc.		
	20 M/S	+0.580 to +0.680 Vdc.		
	10 M/S	+0.265 to +0.365 Vdc.		
	5 M/S	+0.107 to +0.207 Vdc.		
	2.5 M/S	+0.028 to +0.128 Vdc.		
P.	Refer to fig. FO-10, sheet 1. Set RANGE RATE and RANGE MAN/AUTO switches to AUTO. Set UUT PS-1 and UUT PS-2 ON/OFF switches to ON. Set TARGET DIRECTION IN/OUT switch to OUT.	Range lights will light in sequence from 5M to 2560M then from 2560M to 5M.	Check switches S1, S2, S24, S27, S31, and TP11 thumbwheel switch. Check lamp or amplifier for a light that does not light.	Refer to fig. FO-10, sheet 1. Check switches S1, S2, S24, S27, S28, S29, S30 and S31. Replace defective lamp or amplifier assembly of DS10 through DS19.

Table 6-12. SCG Servo Test Panel 2A2A6 Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
P. (cont)	At sight current generator panel (2A1A1) set MANUAL/AUTO switch to AUTO. At SCG servo test panel (2A2A6) press RANGE START switch.		Perform test for SCG servo test panel circuit cards (2A2A6A1, 2A2A6A2, and 2A2A6A3) tables 6-27, 6-28, and 6-29. Perform test for sight current generator panel (2A2A1) table 6-4.	Replace defective circuit card assembly. Check cable assembly W204 for continuity.
Q.	Refer to fig. FO-10, sheet 1. Press RANGE RATE START switch.	Range rate lights will light in sequence from 2.5M/S to SIGN then from SIGN to 2.5M/S.	Check switches S1, S2, S24, S27, S31 and TP11 thumbwheel switch. Check lamp or amplifier for a light that does not light. Perform test for SCG servo test panel circuit cards (2A2A6A1, 2A2A6A2, and 2A2A6A3) tables 6-27, 6-28, and 6-29.	Refer to fig. FO-10, sheet 1. Check switches S1, S2, S24, S27, S28, S29, S31, and TP11 thumbwheel switch. Replace defective lamp or amplifier assembly of DS10 through DS19. Replace circuit card.

Table 6-12. SCG Servo Test Panel 2A2A6 Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
R.	Refer to fig. FO-10, sheet 1. Set TARGET DIRECTION IN/OUT switch to OUT. Press CHART SPEED 5mm/SEC switch. Press RANGE AND RANGE RATE switch.	Refer to fig. 6-1 for chart recorder indication.	Check switches S1, S2, S24, S27, S31, and TP11 thumbwheel switch. Perform test for SCG servo test panel circuit cards (2A2A6A1, 2A2A6A2, and 2A2A6A3) tables 6-27, 6-28, and 6-29.	Refer to fig. FO-10, Sheet 1. Check switches S1, S2, S24, S27, S28, S29, S30 and S31. Replace defective circuit card assembly.
S.	Refer to fig. FO-1, sheet 1. Set TARGET DIRECTION IN/OUT switch to IN. Press RANGE AND RANGE RATE switch.	Refer to fig. 6-2 for chart recorder indication.	Same as step O above.	Same as step O above.
		RANGE lights will light in sequence from 2560M to 5M then from 5M to 2560M.	Same as step P.	Same as step P.
		RANGE RATE lights will light in sequence from SIGN to 2.5 M/S and then from 2.5 M/S to SIGN.	Same as step Q.	Same as step Q.
T.	Measure voltage (dc) at terminal of amplifier 1 or 2.	+14.75 to +15.25 Vdc.	Replace amplifier 1 or 2.	Check switch S33. Check PS-2. Replace defective component.

Table 6-12. SCG Servo Test Panel 2A2A6 Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
U.	Measure TRIG voltage at TRIG CHAN A jack.	-1.37 to +1.37 Vdc.		Check for same condition at CHAN A TRIG LEVEL jack on rear of counter. Check cable W252, replace if defective. Replace counter.
V.	Repeat step U for TRIG CHAN B jack.			

Table 6-13. Inverter/Converter Test Panel 2A2A4 Test and Troubleshooting Procedures

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
1	Make sure all AN/TSM-100 power panel and battery charger ON/OFF switches are set to OFF position and all circuit breakers are set in. NOTE Connectors J1 through J4 must not have cables connected to them.			
2	Using the multimeter, measure resistance between test points listed below and panel switches set to positions indicated.		Continue test.	Check switches S3, S9, and resistor R2. Replace defective component.
	Test point 1 to test point 22			Fig. FO-11, sheets 1 and 4.
	Switch S3 position 2	642.51 to 655.49 ohms		
	Switch S3 position 3, S9 position 2	642.51 to 655.49 ohms		
	Switch S3 position 4	642.51 to 655.49 ohms		
	Test point 2 to test point 22	Less than 1.0 ohm.	Continue test.	Replace defective wiring. Fig. FO-11, sheet 1.
	Test point 3 to J1-G		Continue test.	Check switch S1, resistor R5, and meter M4. Replace defective component. Fig. FO-11, sheets 2 and 4.
	Switch S1 position 3	691.02 to 704.98 ohms		
	Switch S1 position 4, S6 position 2	691.02 to 704.98 ohms		
	Switch S1 position 5	691.02 to 704.98 ohms		
	Switch S1 position 6	691.02 to 704.98 ohms		
	Switch S1 position 7	691.02 to 704.98 ohms		
	Switch S1 position 8	691.02 to 704.98 ohms		
	Switch S1 position 9	691.02 to 704.98 ohms		

Table 6-13. Inverter/Converter Test Panel 2A2A4 Test and Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
3	Test point 4 to test point 5		Continue test.	Check switches S1 and S2. Replace defective component. Check resistors A1R6, A1R7. Replace defective component. Fig. FO-11, sheets 1, 2, and 3.
	Switch S1 position 3, Switch S2, position 2	198 to 202 ohms		
	Switch S1, position 4	198 to 202 ohms		
	Switch S1, position 5	198 to 202 ohms		
	Switch S1, position 6	198 to 202 ohms		
	Switch S1, position 7	198 to 202 ohms		
	Switch S1, position 8	198 to 202 ohms		
	Switch S1, position 9	198 to 202 ohms		
4	Test point 5 to test point 6		Continue test.	Check switches S1 and S2. Replace defective component. Check resistors A1R7 and A1R8. Replace defective component. Fig. FO-11, sheets 1, 2, and 4.
	Switch S1, position 3, Switch S2, position 2	198 to 202 ohms		
	Switch S1, position 4	198 to 202 ohms		
	Switch S1, position 5	198 to 202 ohms		
	Switch S1, position 6	198 to 202 ohms		
	Switch S1, position 7	198 to 202 ohms		
	Switch S1, position 8	198 to 202 ohms		
	Switch S1, position 9	198 to 202 ohms		
5	Test point 8 to test point 2		Continue test.	Check switch S3 resistors R1, R13. Replace defective component.
	Switch S3, position 2	6.7 to 7.3 ohms		
	Switch S3, position 3	6.7 to 7.3 ohms		
6	Test point 7 to test point 14	infinity ohms	Continue test.	Fig. FO-11, sheets 1, 2, and 4. Check relay K1. Replace K1 if defective. Fig. FO-11, sheets 1, 2, and 4.
	Switch S1 position 2	infinity ohms		
	Switch S1 position 3	infinity ohms		
	Switch S1 position 4	infinity ohms		
	Switch S1 position 5	infinity ohms		
	Switch S1 position 6	infinity ohms		
	Switch S1 position 7	infinity ohms		
	Switch S1 position 8	infinity ohms		
	Switch S1 position 9	infinity ohms		

Table 6-13. Inverter/Converter Test Panel 2A2A4 Test and Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
7	Test point 10 to test point 11		Continue test.	Check switches S1, S6, resistors R4, R14. Replace defective component. Fig. FO-11, sheets 1, 2, and 4.
	Switch S1 position 3	198.99 to 203.01 ohms		
	Switch S1 position 4	198.99 to 203.01 ohms		
	Switch S1 position 5	198.99 to 203.01 ohms		
	Switch S1 position 6	198.99 to 203.01 ohms		
	Switch S1 position 7	198.99 to 203.01 ohms		
	Switch S1 position 8	198.99 to 203.01 ohms		
	Switch S1 position 9	198.99 to 203.01 ohms		
8	Test point 12 to test point 10		Continue test.	Check switches S1, S6, resistors R3, R15. Replace defective component. Fig. FO-11, sheets 1, 2, and 4.
	Switch S1 position 3	198.99 to 203.01 ohms		
	Switch S1 position 4	198.99 to 203.01 ohms		
	Switch S1 position 5	198.99 to 203.01 ohms		
	Switch S1 position 6	198.99 to 203.01 ohms		
	Switch S1 position 7	198.99 to 203.01 ohms		
	Switch S1 position 8	198.99 to 203.01 ohms		
	Switch S1 position 9	198.99 to 203.01 ohms		
9	Test point 11 to test point 12		Continue test.	Check switches S1, S6, resistors R3, R4, R14, R15. Replace defective component. Fig. FO-11, sheet 1.
	Switch S1 position 3	397.98 to 406.02 ohms		
	Switch S1 position 4	397.98 to 406.02 ohms		
	Switch S1 position 5	397.98 to 406.02 ohms		
	Switch S1 position 6	397.98 to 406.02 ohms		
	Switch S1 position 7	397.98 to 406.02 ohms		
	Switch S1 position 8	397.98 to 406.02 ohms		
	Switch S1 position 9	397.98 to 406.02 ohms		
		NOTE SCG servo test panel 2A2A6 must be in AN/TSM-100.		

Table 6-13. Inverter/Converter Test Panel 2A2A4 Test and Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
10	Test point 13 to test point 2	30 to 40 ohms		Check ECL1 and associated wiring. Fig. FO-11, sheets 2 and 4.
11	Test point 13 to test point 14		Continue test.	Check load switch (S7), resistors R1, R2. Replace defective component. Fig. FO-11, sheets 2, and 4.
	Load switch position NL Switch S1 position 1	234 to 239 ohms		
	Load switch position FL	157 to 159 ohms		
12	Test point 14 to test point 15	infinity ohms	Continue test.	Check switch S4. Replace S4 if defective. Fig. FO-11, sheet 2.
	Switch S4 position 2	0 ohms		
	Switch S4 position 3	0 ohms		
	Switch S4 position 4	0 ohms		
	Switch S4 position 5	0 ohms		
13	Test point 16 to test point 18		Continue test.	Check switches S4, S5, S6, resistor R11, meter M4. Replace defective component. Fig. FO-11, sheets 2 and 4.
	Switch S4 position 2, S5 position 2	295 to 305 ohms		
	Switch S4 position 3, S6 position 3	295 to 305 ohms		
	Switch S4 position 4,	295 to 305 ohms		
	Switch S4 position 5	295 to 305 ohms		
		NOTE SCG servo test panel 2A2A6 must be in AN/TSM-100.		

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Table 6-13. Inverter/Converter Test Panel 2A2A4 Test and Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
13 (cont)	Switch S4 position 2, S5 position 3	7.5 to 8.5 ohms	Continue test.	Check switches S4, S5, fan FAN 1. Replace defective component. Fig. FO-11, sheets 2, 3 and 4. Fig. FO-11, sheet 3.
	Switch S4 position 3	7.5 to 8.5 ohms		
	Switch S4 position 4	7.5 to 8.5 ohms		
	Switch S4 position 5	7.5 to 8.5 ohms		
14	Test point 17 to test point 18		Continue test.	Check switches S4, S5, S6 resistor R12, meter M4. Replace defective component. Fig. FO-11, sheets 2, 3, and 4.
	Switch S4 position 2, S5 position 2	14.5 to 15.5 ohms		
	Switch S4 position 3	14.5 to 15.5 ohms		
	Switch S4 position 4	14.5 to 15.5 ohms		
	Switch S4 position 5	14.5 to 15.5 ohms		
		NOTE SCG servo test panel 2A2A6 must be in AN/TSM-100.		
	Switch S4 position 2, S5 position 3	2.5 to 3.5 ohms	Continue test.	Check switches S4, S5, S6, M4, fan FAN 1. Replace defective component. Fig. FO-11, sheets 2, 3 and 4.
	Switch S4 position 3	2.5 to 3.5 ohms		
	Switch S4 position 4	2.5 to 3.5 ohms		
	Switch S4 position 5	2.5 to 3.5 ohms		
15	Test point 19 to 19 VDC INPUT (TP23).		Continue test.	Check switches S8, S9 and meter M2. Replace defective component. Fig. FO-11, sheet 2.
	Switch S8 position 2, S9 position 1	infinity ohms		
	Switch S8 position 3	infinity ohms		
	Switch S8 position 4	0 ohms		

Table 6-13. Inverter/Converter Test Panel 2A2A4 Test and Troubleshooting Procedures - Continued

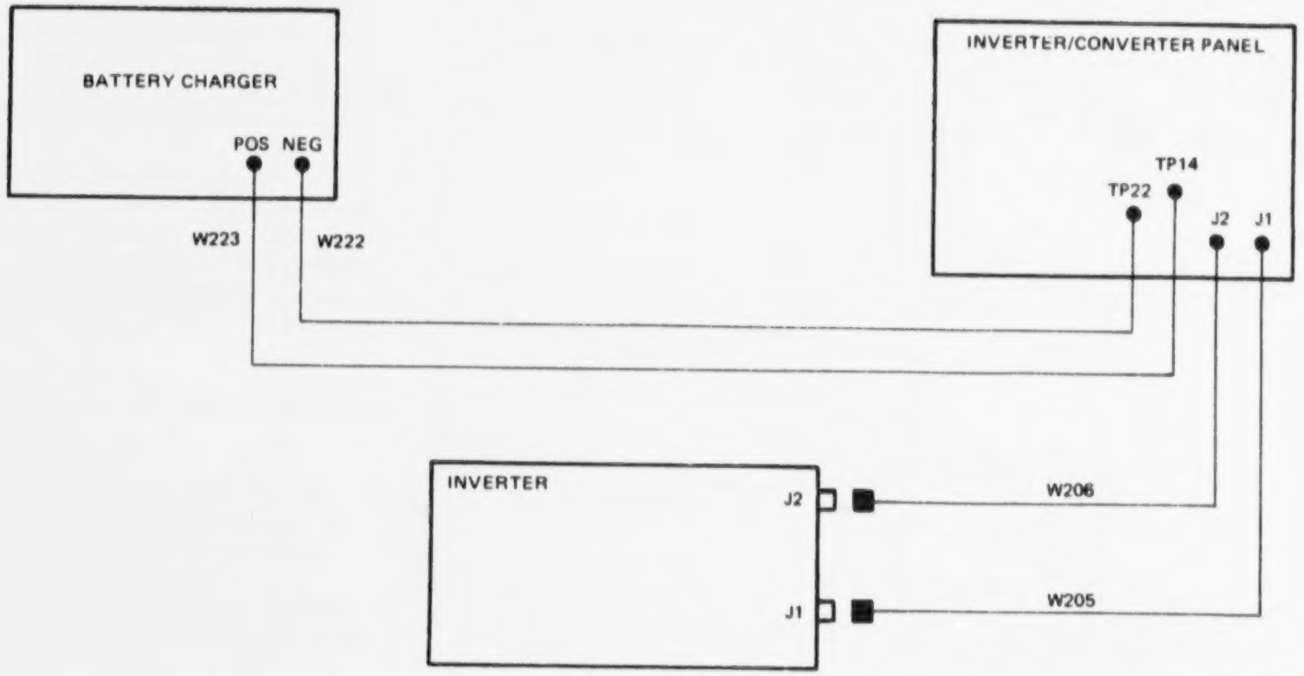
Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
15 (cont)	Switch S8 position 5	0 ohms		
	Switch S8 position 6	infinity ohms		
	Switch S8 position 2, S9 position 3	Less than 1.0 ohm		
	Switch S8 position 3	Less than 1.0 ohm		
	Switch S8 position 4	Less than 1.0 ohm		
	Switch S8 position 5	Less than 1.0 ohm		
	Switch S8 position 6	Less than 1.0 ohm		
16	Test point 20 to test point 2		Continue test.	Check switches S8, S9, resistor R9. Replace defective component. Fig. FO-11, sheets 2, 3 and 4.
	Switch S8 position 2, S9 position 2	infinity ohms		
	Switch S8 position 3	11.0 to 12.0 ohms		
	Switch S8 position 4	infinity ohms		
	Switch S8 position 5	11.0 to 12.0 ohms		
	Switch S8 position 6	Less than 1.0 ohm		
17	Test point 21 to test point 2		Continue test.	Check switches S8, S9, resistor R10. Replace defective component. Fig. FO-11, sheets 2, 3 and 4.
	Switch S8 position 3	11.8 to 12.3 ohms		
	Switch S8 position 4	11.8 to 12.3 ohms		
	Switch S8 position 6	Less than 1.0 ohm		
18	Test point 7 to pin J1-K	Less than 1.0 ohm		Check meter M1. Replace if defective. Fig. FO-11, sheet 1.
19	Test point 7(+) to test point 2(-) Using test leads from test lead kit connect battery charger to test points 14(+) and 22 (-).	+26.0 to +28.0 Vdc.	Continue test.	Check switch S1, relay K1, diode CR1, and capacitor C1. Replace defective component. Fig. FO-11, sheet 1.

Table 6-13. Inverter/Converter Test Panel 2A2A4 Test and Troubleshooting Procedures - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
19 (cont)	Switch S1 position 2, set power panel 115V 400CY 1 PHASE ON/OFF switch to ON, and battery charger power switch to ON. TEST COMPLETE			

Table 6-14. Inverter 2A1A5A2, Test Procedures

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
1.	Set all switches on the AN/TSM-100 to OFF position and all circuit breakers are set in.			
2.	Remove access covers from both battery assemblies.			
3.	On the inverter/converter test panel set all switches to position 1. Set LOAD switch to OFF.			
4.	Connect equipment as shown in fig. 6-3.			
5.	On power panel set 115V 400CY 1 PHASE ON/OFF switch to ON. On battery charger set AC switch to ON. Adjust battery charger for 24 Vdc on panel meter.	Approximately 24.0 Vdc.		
6.	On inverter/converter test panel set switch S3 to 2 and switch S1 to 2.		Check battery charger.	Fig. FO-11, sheet 1.
	Connect multimeter to TP7 (red) and TP2 (black).	+23.0 to +25.0 Vdc.	Check wiring in switches S3 and S2 in inverter/converter test panel.	
	Observe M1 ammeter.	4.0 to 6.0 amperes dc.		


BATTERY CHARGER
POS
NEG
W223
W222
INVERTER/CONVERTER PANEL
TP14
TP22
J2
J1
INVERTER
J2
J1
W206
W205

ARR81-0351

Figure 6-3. Inverter 2A1A5A2 test equipment setup

Table 6-14. Inverter 2A1A5A2, Test Procedures - Continued

Step	Procedure		Normal indication	If indication is abnormal	Reference for abnormal indication
7	Connect multimeter to the following test points and measure no load voltages:				
	Red lead	Black lead			
	TP7	TP2	+23.0 to +25.0 Vdc		
	TP8	TP2	+17.4 to +19.3 Vdc		
	TP1	TP2	+95.0 to +105.0 Vdc		
	TP3	TP2	68.0 to 72 Vac		
	TP4	TP5	122.0 to 126.0 Vac		
	TP6	TP5	122.0 to 126.0 Vac		
	TP6	TP4	122.0 to 126.0 Vac		
	TP10	TP11	66.0 to 68.0 Vac		
	TP10	TP12	66.0 to 68.0 Vac		
	TP11	TP12	132.0 to 136.0 Vac		
8.	Set switch S1 to 3.			Adjust battery charger if necessary.	Fig. FO-11, sheet 1.
	Connect multimeter to TP7 (red) and TP2 (black).		+23.0 to +25.0 Vdc		
	Observe meter M1 indication.		5 to 15 amperes dc.	Replace power static inverter.	
9.	Connect multimeter to the following test points and measure motor load voltages:				Fig. FO-11, sheet 1.
	Red lead	Black lead			
	TP7	TP2	+23.0 to +25.0 Vdc		
	TP8	TP2	+17.4 to +19.3 Vdc		
	TP1	TP2	+95.0 to +105.0 Vdc		
	TP3	TP2	68.0 to 72.0 Vac		
	TP4	TP5	116.0 to 118.0 Vac		
	TP6	TP5	116.0 to 118.0 Vac		

Table 6-14. Inverter 2A1A5A2, Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
9 (cont)	TP6 TP4	116.0 to 118.0 Vac		
	TP10 TP11	64.0 to 66.0 Vac		
	TP10 TP12	64.0 to 66.0 Vac		
	TP11 TP12	128.0 to 132.0 Vac	Replace inverter.	
10.	Set all switches to 1. Connect multimeter to TP7 (red) and TP2 (black). Set switch S3 to 2 and switch S2 to 2 and switch S1 to 3 and measure voltage.	+23.0 to +25.0 Vdc.	Adjust battery charger if necessary.	Fig. FO-11, sheet 1.
	Observe meter M1 indication.	Less than 17.0 amperes dc.	Replace inverter.	
11.	Connect multimeter to the following test points and measure resistor load voltages:			Fig. FO-11, sheet 1.
	Red lead Black lead			
	TP8 TP2	+17.4 to +19.3 Vdc		
	TP1 TP2	+95.0 to +105.0 Vdc		
	TP3 TP2	66.0 to 68.0 Vac		
	TP4 TP5	116.0 to 118.0 Vac		
	TP6 TP5	116.0 to 118.0 Vac		
	TP6 TP4	116.0 to 118.0 Vac		
	TP10 TP11	64.0 to 66.0 Vac		
	TP10 TP12	64.0 to 66.0 Vac		
	TP11 TP12	128.0 to 132.0 Vac	Replace inverter.	
12.	Set all switches to 1. Set switch S6 to 2 and switch S9 to 2.			Fig. FO-11, sheets 1 and 2.

Table 6-14. Inverter 2A1A5A2, Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
12. (cont)	NOTE Switches S6 and S9 will remain in position 2 until the conclusion of step 15.			
	Set switch S2 to 1 and LOAD switch to OFF.			
	Set switch S1 to the following positions and observe meter M4 indications			
	4	Less than 0.5 amperes ac		
	5	Less than 1.5 amperes ac		
	6	Less than 1.5 amperes ac		
	7	Less than 1.5 amperes ac		
	8	Less than 0.4 amperes ac		
	9	Less than 0.4 amperes ac	Replace inverter.	
13.	Set switch S2 to 2.			Fig. FO-11, sheets 1 and 2.
	Set switch S1 to the following positions and observe meter M4 indications.			
	4	Less than 0.5 amperes ac		
	5	Less than 0.7 amperes ac		
	6	Less than 0.7 amperes ac		
	7	Less than 0.7 amperes ac		
	8	Less than 0.4 amperes ac		
	9	Less than 0.4 amperes ac	Replace inverter.	

Table 6-14. Inverter 2A1A5A2, Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
14.	Set switch S2 to 1 and LOAD switch to NL. Set switch S1 to the following positions and observe meter M4 indications.			Fig. FO-11, sheets 1 and 2.
	4	Less than 0.5 amperes ac		
	5	Less than 1.5 amperes ac		
	6	Less than 1.5 amperes ac		
	7	Less than 1.5 amperes ac		
	8	Less than 0.4 amperes ac		
	9	Less than 0.4 amperes ac	Replace inverter.	
15.	Set LOAD switch to FL. Set switch S1 to the following position and observe meter M4 indications.			Fig. FO-11, sheets 1 and 2.
	4	Less than 0.5 amperes ac		
	5	Less than 1.5 amperes ac		
	6	Less than 1.5 amperes ac		
	7	Less than 1.5 amperes ac		
	8	Less than 0.4 amperes ac		
	9	Less than 0.4 amperes ac	Replace inverter.	
16.	Set all switches to 1 and LOAD switch to OFF. Set switch S2 to 2, switch S3 to 3, switch S1 to 2, and switch S9 to 2. Observe meter M2 indication.	Less than 0.2 amperes dc		Fig. FO-11, sheets 1 and 2.
17.	Set switch S3 to 4. Observe meter M2 indication.	Less than 2.9 amperes dc	Replace inverter.	

Table 6-14. Inverter 2A1A5A2, Test Procedures - Continued

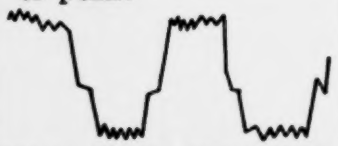
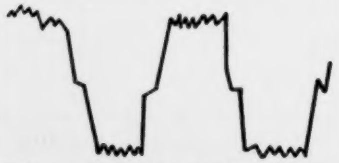
Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
18.	Set all switches to 1. Set switch S1 to 2.			
19.	Connect a X10 probe between CH1 of the oscilloscope and the following test points and measure peak-to-peak waveform. Voltages:			Fig. FO-11, sheets 1 and 2.
	TP2 and TP3	396 to 404 Hz sine wave 187 to 204 Volts peak-to-peak.	Replace inverter.	
	TP4 and TP5	396 to 404 Hz sine wave 302 to 360 Volts peak-to-peak.		
	TP6 and TP5	396 to 404 Hz sine wave 302 to 360 Volts peak-to-peak.		
	TP6 and TP4	396 to 404 Hz sine wave 302 to 360 Volts peak-to-peak.		
	TP12 and TP11	 396 to 404 Hz 297 to 303 Volts peak-to-peak.		
	TP10 and TP12 TP10 and TP11	 396 to 404 Hz 126 to 155 Volts peak-to-peak.		

Table 6-15. ±15 Vdc Power Supply 2A2A5A2, Test Procedures

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
1.	Set all ON/OFF switches on the AN/TSM-100 to OFF and press all circuit breakers.			
2.	Remove access covers from both battery assemblies. Disconnect batteries from AN/TSM-100.			
3.	Connect W207 to J4 on Inverter/Converter Test Panel and to six terminals on ±15 Vdc power supply.			
4.	Connect W223 (red) to 19 VDC input on Inverter/converter test panel and to POS terminal on battery charger.			
5.	Connect W222 (black) to TP22 on Inverter/converter test panel and on negative terminal on battery charger.			
6.	Set all switches on Inverter/converter test panel to position 1.			
7.	On power panel set 115V 400CY 1 PHASE ON/OFF switch to ON. On battery charger set AC switch to ON. Adjust battery charger for 18.0 Vdc on panel meter.	 +18.0 Vdc.		

Table 6-15. ±15 Vdc Power Supply 2A2A5A2, Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
8.	Connect multimeter red lead to TP19 and black lead to TP2.	-0.3 to +0.3 Vdc		
9.	Set switch S9 to position 3 and switch S8 to position 2.	Multimeter indicates between +18.18 and +18.53 Vdc.	Adjust battery charger if necessary.	
10.	Connect multimeter red lead to TP21. If necessary, adjust unit under test -15V adjustment screw until multimeter indicates between -14.85 and -19.00 Vdc.	Multimeter indicates between -14.85 and -19.00 Vdc.		
11.	Connect multimeter red lead to TP20. If necessary, adjust unit under test +15V adjustment screw until multimeter indicates between +14.85 and +19.00 Vdc.	a. Multimeter indicates between +14.85 and +19.00 Vdc. b. Meter M2 on test panel indicates less than 0.3 amps.		
12.	Set switch S8 to position 3.			
13.	Connect multimeter red lead to TP19 and black lead to TP2. Adjust battery charger between +18.17 and +18.53 Vdc.	a. +18.35 Vdc. b. Meter M2 on test panel indicates less than 4 amps.	Replace battery charger.	
14.	Move multimeter red lead to TP20. If necessary, adjust unit under test +15V adjustment screw until multimeter indicates between +14.85 and +15.15 Vdc.	+14.85 to +15.15 Vdc.	Replace ±15 Vdc power supply.	

Table 6-15. ±15 Vdc Power Supply 2A2A5A2, Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
15.	Move multimeter red lead to TP21. If necessary, adjust unit under test -15V adjustment screw until multimeter indicates between -14.85 and -15.15 Vdc.	-14.85 to -15.15 Vdc.	Replace ±15 Vdc power supply.	Return to depot.
16.	Set switch S8 to position 4.	Meter M2 on test panel indicates between 1.27 and 1.41 Amps.		
17.	Set switch S8 to position 5.	Meter M2 on test panel indicates between 1.27 and 1.41 Amps.		
18.	Set switch S8 to position 6.			
19.	Connect multimeter red lead to TP21 and black lead to TP2.	a. Multimeter indicates between -0.1 and +0.1 Vdc. b. Meter M2 on test panel indicates between 0.50 and 0.70 Amps.		
20.	Move multimeter red lead to TP20.	Multimeter indicates between -0.1 and +0.1 Vdc.		
21.	Set switch S8 to position 3.	a. Multimeter indicates between +14.85 and +15.15 Vdc. b. Meter M2 on test panel indicates less than 4 Amps.	Replace ±15 Vdc power supply.	

Table 6-15. ±15 Vdc Power Supply 2A2A5A2, Test Procedures - Continued

Step	Procedure	Normal indication	If indication is abnormal	Reference for abnormal indication
22.	Move multimeter red lead to TP21.	Multimeter indicates between -14.85 and -15.15 Vdc.	Replace ±15 Vdc power supply.	

Section IV. TEST AND TROUBLESHOOTING CIRCUIT CARD ASSEMBLIES

6-7. Instructions for Use of Circuit Card Assembly Test and Troubleshooting Tables. Test and troubleshooting procedures for circuit card assemblies in the AN/TSM-100 are contained in tables 6-16 through 6-29. The first seven columns in each table provide a complete checkout procedure for each circuit card. The last column is used for troubleshooting if an abnormal indication is obtained during testing.

a. Perform the instructions given in the first six columns for each step, then read the "Normal indication" column for that step. If the indication obtained is acceptable, proceed to the next step. If the indication is not acceptable, isolate the fault in accordance with the information provided in the last column.

b. The test tables contain five columns, headed and described as follows:

(1) "Step". Use this column for reference purposes and to distinguish each separate operation.

(2) "Test Card". Use this column to identify the punched test card to be inserted into the reader of the MX-8050 test set for each step or series of steps. Do not proceed with a step unless the TEST IDENT indications (entered immediately below the alphanumeric test card designation) are lit on the MX-8050 test set. Change the test card each time a different alphanumeric designator appears in this column.

(3) "Test Instrument Controls and Connections". Make all connections and control settings specified in this column. Connections are assumed to be between the test instrument specified and the MX-8050 test set.

(4) "MX-8050 Controls".

(a) Set TEST POINTS A and TEST POINTS B thumbwheel switches on the MX-8050 test set as indicated by the numbers (not in parentheses) in the A and B column under "Test points". The letters or numbers in parentheses immediately below the switch settings identify the terminals of the circuit card assembly to which the test instrument in the preceding column is connected. For circuit card assemblies 2A2A6A1, 2A2A6A2, and 2A2A6A3, the thumbwheel switch settings are the same as the terminals of the circuit card assembly to which the test instrument in the preceding column is connected.

(b) Set all controls on the MX-8050 test set (other than the thumbwheel switches) as specified in the "Other" column.

(5) "Normal Indication". On the test instrument being used for the checkout step, look for the indication specified in this column. If the indication is abnormal, proceed to the next column.

(6) "Corrective Action If Indication Abnormal". Use standard techniques to verify the specific faulty component from among those identified in this column as being the probable cause. Diagrams and other helpful information related to fault isolation are identified in this column.

c. When the defective part has been identified repair the circuit card in accordance with applicable instructions contained in chapter 7. Perform necessary inspection and retest procedures listed in chapter 8 before returning the circuit card to service.

6-8. Preparation for Testing Circuit Card Assemblies. Complete the following steps prior to starting testing of a circuit card assembly.

a. Turn on AN/TSM-100 as follows:

(1) On power panel (2A1A3):
115 V 400 CY 1 PHASE ON/OFF switch -ON (indicator lights)
DISTRIBUTION +24 VDC ON/OFF switch -ON (indicator lights)
DISTRIBUTION switch -UNIT NO.1 (indicator lights)

(2) On battery charger (2A1A4):
AC-ON switch -ON (indicator lights)
MODE CURRENT ADJUST - Fully clockwise
MODE VOLTAGE ADJUST - +27.0 to +27.5 V

b. On power supply 1A1A4 in AN/TPM-22 Radar Test Set, set TEST MODE switch to P.C. CARDS and press 115 V 400 CPS switch and +24 VDC switch to ON (indicator light).

c. Set oscilloscope control as follows:

Control	Position
POWER ON	ON
HORIZ DISPLAY	A LOCK KNOBS
A TRIGGER:	
SLOPE	+
COUPLING	AC
SOURCE	CH 1
LEVEL	As required
TRIG MODE	AUTO
VERT MODE	CH 1
Input CH 1	DC
Input CH 2	DC

d. Set multimeter controls as follows:

Control	Position
POWER	ON
MODE	FILTER OUT
FUNCTION	DC
RANGE	AUTO

6-9. Power Panel Circuit Card 2A1A3A1.

a. Perform preparatory procedures described in paragraph 6-8.

b. Insert test adapter CP11 into test socket on the MX-8050.

c. Insert circuit card assembly into test adapter.

d. Depress POWER OFF/ON switch on MX-8050 to the ON position.

e. Depress PROFILE OFF/ON switch on MX-8050 to the OFF position.

f. Insert first test card (identified in test card column of table 6-16) into card reader, with clipped corner down and toward rear of test set.

g. Move card reader handle to right and observe that all power indicators on the MX-8050 test set are lit.

h. Observe that correct TEST IDENT indicators (identified in the test card column of table 6-16) are lit.

i. Refer to table 6-16 and perform test and troubleshooting procedures, changing the test card in the card reader as shown in the test card column. Refer to fig. FO-12 schematic diagram as an aid in troubleshooting.

j. Upon completion of tests, remove test card by moving card reader handle to left, depress POWER OFF/ON switch to the OFF position, remove test adapter and circuit card assembly, and turn off the AN/TSM-100 and AN/TPM-22 test sets.

Table 6-16. Power Panel Circuit Card 2A1A3A1, Test and Troubleshooting Procedures

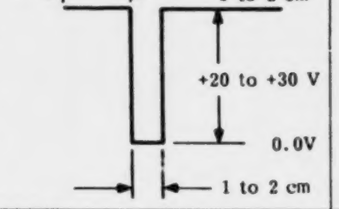
Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication	Corrective action if indication abnormal
			TEST POINT		Other		
			A	B			
1	B11 TEST IDENT B 1 2 8	Oscilloscope Connect: Input CH 1 to test point A Probe ground to GRD 1 Controls: A TRIG MODE to AUTO TIME/DIV to 0.5 ms SOURCE CH 1 VOLTS/DIV CH 1 to 5 VERT MODE CH 1	17 (15)		MATRIX SELECTOR 1 to position 2. MATRIX SELECTOR 2 to position 2.		Check Q1 and Q2 (free running oscillator stages).
2	B13 TEST IDENT B 1 4 8	Disconnect oscilloscope probe Multimeter Connect cable W283: Red probe to test point A Black probe to test point B Controls: FUNCTION to VDC RANGE to AUTO	19 (17)	25 (28)	MATRIX SELECTOR 1 to position 12 MATRIX SELECTOR 2 to position 12	Min. Nom. Max. +24.5 Vdc +25.0 Vdc +25.5 Vdc	Check CR9 (reverse direction).
3			38 (18)	25 (28)		+24.5 Vdc +25.0 Vdc +25.5 Vdc	Check CR8 (reverse direction).
4	B14 TEST IDENT B 2 4 8		19 (17)	25 (28)		-0.4 Vdc -0.6 Vdc -0.8 Vdc	Check CR9 (forward direction).
5			38 (18)	25 (28)		-0.4 Vdc -0.6 Vdc -0.8 Vdc	Check CR8 (forward direction).
6	B15 TEST IDENT B 1 2 4 8		11 (9)	25 (28)		+24.5 Vdc +25.0 Vdc +25.5 Vdc	Check CR4 (reverse direction).

Table 6-16. Power Panel Circuit Card 2A1A3A1, Test and Troubleshooting Procedures - Continued

Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication			Corrective action if indication abnormal
			TEST POINT		Other				
			A	B		Min	Nom.	Max.	
7			39 (19)	25 (28)		+24.5 Vdc	+25.0 Vdc	+25.5 Vdc	Check R5 (reverse direction).
8	B16 TEST IDENT B 16		11 (9)	25 (28)		-0.4 Vdc	-0.6 Vdc	-0.8 Vdc	Check CR4 (forward direction).
9			39 (19)	25 (28)		-0.4 Vdc	-0.6 Vdc	-0.8 Vdc	Check CR5 (forward direction).
10	B17 TEST IDENT B 1 16		9 (7)	25 (28)		+24.5 Vdc	+25.0 Vdc	+25.5 Vdc	Check CR11 (reverse direction).
11			14 (12)	25 (28)		+24.5 Vdc	+25.0 Vdc	+25.5 Vdc	Check CR1 (reverse direction).
12	B18 TEST IDENT B 2 16		9 (7)	25 (28)		-0.4 Vdc	-0.6 Vdc	-0.8 Vdc	Check CR11 (forward direction).
13			14 (12)	25 (28)		-0.4 Vdc	-0.6 Vdc	-0.8 Vdc	Check CR1 (forward direction).
14	B19 TEST IDENT B 1 2 16		5 (3)	25 (28)		+24.5 Vdc	+25.0 Vdc	+25.5 Vdc	Check CR3, CR7 (reverse direction).
15			13 (11)	25 (28)		+24.5 Vdc	+25.0 Vdc	+25.5 Vdc	Check CR10 (reverse direction).

Table 6-16. Power Panel Circuit Card 2A1A3A1, Test and Troubleshooting Procedures - Continued

Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication			Corrective action if indication abnormal
			TEST POINT		Other				
			A	B		Min.	Nom.	Max.	
16	B20 TEST B 4 16		5 (3)	25 (28)		-0.4 Vdc	-0.6 Vdc	-0.8 Vdc	Check CR7 (forward direction).
17			13 (11)	25 (28)		-0.4 Vdc	-0.6 Vdc	-0.8 Vdc	Check CR10 (forward direction).
18	B21 TEST IDENT B 1 4 16		7 (5)	4 (2)		+24.5 Vdc	+25.0 Vdc	+25.5 Vdc	Check CR13 (reverse direction).
19			7 (5)	5 (3)		+24.5 Vdc	+25.0 Vdc	+25.5 Vdc	Check CR12 (reverse direction).
20	B22 TEST IDENT B 2 4 16		7 (5)	4 (2)		-0.4 Vdc	-0.6 Vdc	-0.8 Vdc	Check CR13 (forward direction).
21			7 (5)	5 (3)		-0.4 Vdc	-0.6 Vdc	-0.8 Vdc	Check CR12 (forward direction).
22	B12 TEST IDENT B 4 8		26 (28)	7 (5)	RESET to OFF	+0.4 Vdc	+0.6 Vdc	+0.8 Vdc	Check CR3 (forward direction.
23		Disconnect black probe from test point B and connect it to GRD 2.	26 (28)		MATRIX SELECTOR 1 to position 1. RESET to ON.	+0.4 Vdc	+0.6 Vdc	+0.8 Vdc	Check CR6 (forward direction).

Table 6-16. Power Panel Circuit Card 2A1A3A1, Test and Troubleshooting Procedures - Continued

Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication			Corrective action if indication abnormal
			TEST POINT		Other				
			A	B		Min.	Nom.	Max.	
24			7 (5)		MATRIX SELECTOR 1 to position 12. MATRIX SELECTOR 2 to position 1.	-0.4 Vdc	-0.6 Vdc	-0.8 Vdc	Check CR14 (forward direction).
25	B23 TEST IDENT B 1 2 4 16		44 (24)	46 (26)		+24.5 Vdc	+25.0 Vdc	+25.5 Vdc	Check CR2 (reverse direction).
26	B24 TEST IDENT B 8 16		44 (24)	46 (26)		-0.4 Vdc	-0.6 Vdc	-0.8 Vdc	Check CR2 (forward direction).
27	B25 TEST IDENT B 1 8 16		7 (5)		MATRIX SELECTOR 2 to position 12	+22.0 Vdc	+24.0 Vdc	+28.0 Vdc	Check CR14 (reverse direction).
28			26 (28)			-24.5 Vdc	-25.0 Vdc	-25.5 Vdc	Check CR6 (reverse direction).

6-10. Sight Current Generator Circuit Card 2A1A1A1.

a. Perform preparatory procedures described in paragraph 6-8.

b. Insert test adapter CP11 into test socket on the MX-8050.

c. Insert circuit card assembly into test adapter.

d. Depress POWER OFF/ON switch on MX-8050 to the ON position.

e. Depress PROFILE OFF/ON switch on MX-8050 to the OFF position.

f. Insert first test card (identified in test card column of table 6-17) into card reader, with clipped corner down and toward rear of test set.

g. Move card reader handle to right and observe that all power indicators on the MX-8050 test set are lit.

h. Observe that correct TEST IDENT indicators (identified in the test card column of table 6-17) are lit.

i. Refer to table 6-17 and perform test and troubleshooting procedure, changing the test card in the card reader as shown in the test card column. Refer to figure FO-13 schematic diagram as an aid in troubleshooting.

j. Upon completion of tests, remove test card by moving card reader handle to left, depress POWER OFF/ON switch to the OFF position, remove test adapter and circuit card assembly, and turn off the AN/TSM-100 and AN/TPM-22 test sets.

Table 6-17. Sight Current Generator Circuit Card 2A1A1A1, Test and Troubleshooting Procedures

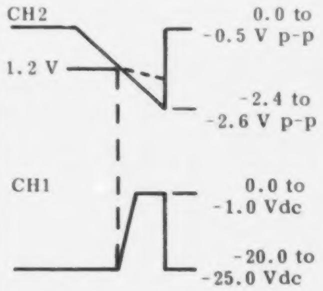
Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication	Corrective action if indication abnormal
			TEST POINT		Other		
			A	B			
1	B6 TEST IDENT B 2 4	Digital multimeter Use cable W282 to make the following connections: + RATIO probe to test point A + INPUT probe to test point B Black probes to GRD 2 Controls: MODE to RATIO ON RANGE to AUTO FUNCTION VDC	10 (8)	39 (19)		Min. Nom. Max. -0.36 Vdc -0.38 Vdc -0.40 Vdc	Check R13, R14.
2		Disconnect + RATIO probe from test point A. Connect + INPUT probe to test point A. Controls: MODE to RATIO OFF.	44 (24)	25 (28)		+19.0 Vdc +20.0 Vdc +21.0 Vdc	Check CR1, CR7.
3		Disconnect red and black probes. Oscilloscope Connect: INPUT CH1 to test point A INPUT CH2 to test point B Probe grounds to GRD 2 EXT TRIG INPUT (A TRIG) to coax test point B using cable W9. Controls: VERT MODE to CHOP A TRIGGER SOURCE to EXT A TRIG MODE to NORM TIME/DIV CH1 to .5 ms CH1 VOLTS/DIV to 5V CH2 VOLTS/DIV to 1V	13 (11)	14 (12)	Set signal generator controls as follows: MAIN OUTPUT to REAR FUNCTION to N SWEEP WIDTH to X100 X.1/NORM to NORM POWER to ON Adjust signal generator for 250 Hz sawtooth wave on CH2 of oscilloscope. MATRIX SELECTOR 1 to position 12.	Decay of slope acceptable in area indicated by dash line.  CH2 0.0 to -0.5 V p-p 1.2 V -2.4 to -2.6 V p-p CH1 0.0 to -1.0 Vdc -20.0 to -25.0 Vdc	CH2: Check Input to pin 12. CH1: Check Q2 stage.

Table 6-17. Sight Current Generator Circuit Card 2A1A1A1, Test and Troubleshooting Procedures - Continued

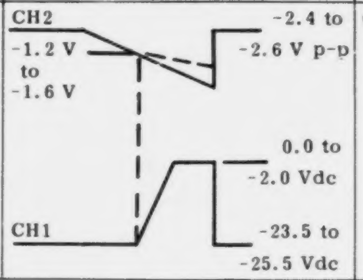
Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication			Corrective action if indication abnormal
			TEST POINT		Other				
			A	B					
4			11 (9)	14 (12)					CH1: Check Q3 and Q4 stages.
5	B7 TEST IDENT B 1 2 4	Oscilloscope Disconnect CH1,CH2, probes and cable W9 EXT. TRIG probe. Multimeter Connect: + INPUT probe to test point A - INPUT probe to test point B Controls: FUNCTION to DC RANGE to AUTO	24 (28)	44 (24)	MATRIX SELECTOR 1 to position 12.	Min. +0.4 Vdc	Nom. +0.6 Vdc	Max. +0.8 Vdc	Check CR1 (forward direction).
6			42 (22)	46 (26)	MATRIX SELECTOR 2 to position 12.	+0.4 Vdc	+0.6 Vdc	+0.8 Vdc	Check CR8 (forward direction).
7	B8 TEST IDENT B 8		19 (17)	25 (28)	MATRIX SELECTOR 1 to position 12. MATRIX SELECTOR 2 to position 10. To obtain proper indications for 7 through 10 perform tests in sequence indicated: a. TEST to 2. b. RESET to OFF c. TEST to 1.	+22 Vdc	+24 Vdc	+28 Vdc	Check Q1 for anode-to-cathode short.
8			40 (20)	25 (28)	d. RESET to ON	+21 Vdc	+23 Vdc	+27 Vdc	Check R15,R16, and C1. Check gate circuit of Q1.

Table 6-17. Sight Current Generator Circuit Card 2A1A1A1, Test and Troubleshooting Procedures - Continued

Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication			Corrective action if indication abnormal
			TEST POINT		Other	Min.	Nom.	Max.	
			A	B					
9			19 (17)	25 (28)	e. RESET to OFF	+0.2 Vdc	+0.8 Vdc	+1.5 Vdc	Check Q1 for anode-to-cathode open.
10			19 (17)	25 (28)	f. TEST to 2 g. TEST to 1	+22 Vdc	+24 Vdc	+28 Vdc	Check Q1 for short.
11	B9 TEST IDENT B 1 8		9 (7)	26 (28)	MATRIX SELECTOR 1 to position 12. MATRIX SELECTOR 2 to position 12.	+22 Vdc	+24 Vdc	+28 Vdc	Check CR2 (reverse direction).
12			46 (26)	26 (28)		+22 Vdc	+24 Vdc	+28 Vdc	Check CR3 (reverse direction).
13			43 (23)	26 (28)		+14.4 Vdc	+15.4 Vdc	+16.4 Vdc	Check R8,R9,R10. Check ±15V REG of MX-8050.
14	B10 TEST IDENT B 2 8		26 (28)	46 (26)	MATRIX SELECTOR 1 to position 12.	+0.4 Vdc	+1.2 Vdc	+1.6 Vdc	Check CR2,CR3 (forward direction).
15			9 (7)	46 (26)		+0.4 Vdc	+0.6 Vdc	+0.8 Vdc	Check CR3 (forward direction).
16			42 (22)	46 (26)	MATRIX SELECTOR 2 to position 12.	-14.5 Vdc	-15.0 Vdc	-15.5 Vdc	Check CR8 (reverse direction). Check ±15V REG of MX-8050
17		Disconnect probes. Controls: FUNCTION to Ω RANGE to AUTO Remove circuit card. Connect red and black multimeter probes to pins 16 and 18 on circuit card and measure resistance.				1.8 ohms	2.0 ohms	2.2 ohms	Check R12.

6-11. Logic Function Resistors Circuit Card 2A1A2A1.

a. Perform preparatory procedures described in paragraph 6-8.

b. Insert test adapter CP11 into test socket on the MX-8050.

c. Insert circuit card assembly into test adapter.

d. Depress POWER OFF/ON switch on MX-8050 to the ON position.

e. Depress PROFILE OFF/ON switch on MX-8050 to the OFF position.

f. Insert first test card (identified in test card column of table 6-18) into card reader, with clipped corner down and toward rear of test set.

g. Move card reader handle to right and observe that all power indicators on the MX-8050 test set are lit.

h. Observe that correct TEST IDENT indicators (identified in the test card column of table 6-18) are lit.

i. Refer to table 6-18 and perform test and troubleshooting procedures, changing the test card in the card reader as shown in the test card column. Refer to figure FO-14 schematic diagram as an aid in troubleshooting.

j. Upon completion of tests, remove test card by moving card reader handle to left, depress POWER OFF/ON switch to the OFF position, remove test adapter and circuit card assembly, and turn off the AN/TSM-100 and AN/TPM-22 test sets.

Table 6-18. Logic Function Resistors Circuit Card 2A1A2A1, Test and Troubleshooting Procedures

Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication			Corrective action if indication abnormal
			TEST POINT		Other				
			A	B		Min.	Nom.	Max.	
1	B37 TEST IDENT B 1 4 32	Multimeter Connect cable W283: Red probe to test point A Black probe to test point B Controls: FUNCTION to Ω RANGE to AUTO	11 (9)	12 (10)			0.0 ohms	2.0 ohms	Check wiring.
2			13 (11)	14 (12)			0.0 ohms	0.5 ohms	Check wiring.
3			18 (16)	19 (17)			0.0 ohms	0.5 ohms	Check wiring.
4			38 (18)	39 (19)			0.0 ohms	0.5 ohms	Check wiring.
5			40 (20)	41 (21)			0.0 ohms	0.5 ohms	Check wiring.
6			42 (22)	43 (23)			0.0 ohms	0.5 ohms	Check wiring.
7			46 (26)	47 (27)			0.0 ohms	0.5 ohms	Check wiring.
8			11 (9)	30 (13)		0.930k ohms	1.00k ohms	1.07k ohms	Check R7.
9			13 (11)	30 (13)		0.930k ohms	1.00k ohms	1.07k ohms	Check R6.
10			18 (16)	30 (13)		0.930k ohms	1.00k ohms	1.07k ohms	Check R5.
11			38 (18)	30 (13)		0.930k ohms	1.00k ohms	1.07k ohms	Check R4.
12			40 (20)	30 (13)		0.930k ohms	1.00k ohms	1.07k ohms	Check R3.
13			42 (22)	30 (13)		0.930k ohms	1.00k ohms	1.07k ohms	Check R2.

Table 6-18. Logic Function Resistors Circuit Card 2A1A2A1, Test and Troubleshooting Procedures - Continued

Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication			Corrective action if indication abnormal
			TEST POINT		Other				
			A	B		Min.	Nom.	Max.	
14			46 (26)	30 (13)		0.930k ohms	1.00k ohms	1.07k ohms	Check R1.
15			4 (2)	6 (4)		69.75k ohms	75.00k ohms	80.25k ohms	Check R9.

6-12. Relay Sense Resistors Circuit Card 2A1A2A2.

a. Perform preparatory procedures described in paragraph 6-8.

b. Insert test adapter CP11 into test socket on the MX-8050.

c. Insert power panel circuit card assembly into test adapter.

d. Depress POWER OFF/ON switch on MX-8050 to the ON position.

e. Depress PROFILE OFF/ON switch on MX-8050 to the OFF position.

f. Insert first test card (identified in test card column of table 6-19) into card reader, with clipped corner down and toward rear of test set.

g. Move card reader handle to right and observe that all power indicators on the MX-8050 test set are lit.

h. Observe that correct TEST IDENT indicators (identified in the test card column of table 6-19) are lit.

i. Refer to table 6-19 and perform test and troubleshooting procedures, changing the test card in the card reader as shown in the test card column. Refer to figure FO-15 schematic diagram as an aid in troubleshooting.

j. Upon completion of tests, remove test card by moving card reader handle to left, depress POWER OFF/ON switch to the OFF position, remove test adapter and circuit card assembly, and turn off the AN/TSM-100 and AN/TPM-22 test sets.

Table 6-19. Relay Sense Resistors Circuit Card 2A1A2A2, Test and Troubleshooting Procedures

Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication			Corrective action if indication abnormal
			TEST POINT		Other				
			A	B		Min.	Nom.	Max.	
1	B37 TEST IDENT 1 4 32	Multimeter Connect cable W283: Red probe to test point A Black probe to test point B Controls: FUNCTION to Ω RANGE to AUTO	4 (2)	7 (5)		3.510k ohms	3.900k ohms	4.290k ohms	Check R1.
2			5 (3)	8 (6)		3.510k ohms	3.900k ohms	4.290k ohms	Check R3.
3			9 (7)	11 (9)		3.510k ohms	3.900k ohms	4.290k ohms	Check R7.
4			10 (8)	12 (10)		3.510k ohms	3.900k ohms	4.290k ohms	Check R5.
5			13 (11)	14 (12)		3.510k ohms	3.900k ohms	4.290k ohms	Check R9
6			18 (16)	19 (17)		3.510k ohms	3.900k ohms	4.290k ohms	Check R13.
7			30 (13)	17 (15)		3.510k ohms	3.900k ohms	4.290k ohms	Check R11.
8			38 (18)	39 (19)		3.510k ohms	3.900k ohms	4.290k ohms	Check R15.
9			42 (22)	43 (23)		3.510k ohms	3.900k ohms	4.290k ohms	Check R17.
10			46 (26)	47 (27)		3.510k ohms	3.900k ohms	4.290k ohms	Check R19.
11			7 (5)	3 (1)		0.612k ohms	0.680k ohms	0.748k ohms	Check R2.
12			8 (6)	3 (1)		0.612k ohms	0.680k ohms	0.748k ohms	Check R4.
13			11 (9)	3 (1)		0.612k ohms	0.680k ohms	0.748k ohms	Check R8.

Table 6-19. Relay Sense Resistors Circuit Card 2A1A2A2, Test and Troubleshooting Procedures - Continued

Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication			Corrective action if indication abnormal
			TEST POINT		Other				
			A	B		Min.	Nom.	Max.	
14			12 (10)	3 (1)		0.612k ohms	0.680k ohms	0.748k ohms	Check R6.
15			14 (12)	3 (1)		0.612k ohms	0.680k ohms	0.748k ohms	Check R10.
16			17 (15)	3 (1)		0.612k ohms	0.680k ohms	0.748k ohms	Check R12.
17			18 (16)	3 (1)		0.612k ohms	0.680k ohms	0.748k ohms	Check R14.
18			38 (18)	3 (1)		0.612k ohms	0.680k ohms	0.748k ohms	Check R16.
19			42 (22)	3 (1)		0.612k ohms	0.680k ohms	0.748k ohms	Check R18.
20			46 (26)	3 (1)		0.612k ohms	0.680k ohms	0.748k ohms	Check R20.

6-13. Relay Sense and K12 Operation Circuit Card 2A1A2A3.

a. Perform preparatory procedures described in paragraph 6-8.

b. Insert test adapter CP11 into test socket on the MX-8050.

c. Insert circuit card assembly into test adapter.

d. Depress POWER OFF/ON switch on MX-8050 to the ON position.

e. Depress PROFILE OFF/ON switch on MX-8050 to the OFF position.

f. Insert first test card (identified in test card column of table 6-20) into card reader, with clipped corner down and toward rear of test set.

g. Move card reader handle to right and observe that all power indicators on the MX-8050 test set are lit.

h. Observe that correct TEST IDENT indicators (identified in the test card column of table 6-20) are lit.

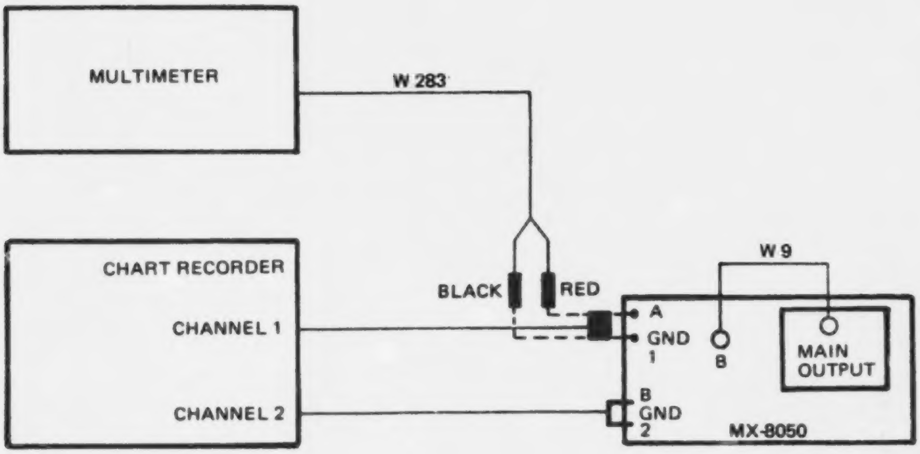
i. Refer to table 6-20 and perform test and troubleshooting procedures, changing the test card in the card reader as shown in the test card column. Refer to figure FO-16 schematic diagram as an aid in troubleshooting.

NOTE

Plug red stripe terminal of cable W85 connector into + red terminal of power supply.

j. Adjust power supply subassembly PP6323 (1A2A4) on AN/TPM-22 Radar Test Set between +18.8 to +19.0 Vdc output and use cable assembly W85 to connect the output to DC IN connector on the MX-8050 test set.

k. Upon completion of tests, remove test card by moving card reader handle to left, depress POWER OFF/ON switch to the OFF position, remove test adapter and circuit card assembly, and turn off the AN/TSM-100 and AN/TPM-22 test sets.


MULTIMETER
W 283
CHART RECORDER
CHANNEL 1
CHANNEL 2
BLACK
RED
W 9
A
GND
1
B
MAIN
OUTPUT
B
GND
2
MX-8050

ARR81-0352

Figure 6-4. Circuit card assemblies 2A1A2A3, 2A1A2A4, 2A1A2A5, and 2A1A2A6 test equipment setup

Table 6-20. Relay Sense and K12 Operation Circuit Card 2A1A2A3, Test and Troubleshooting Procedures

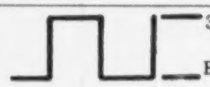
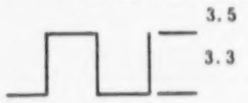
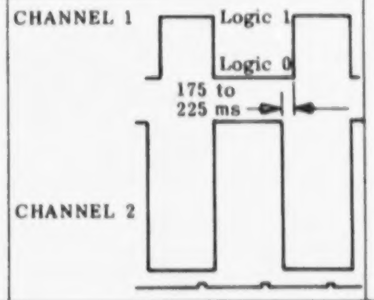
Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication	Corrective action if indication abnormal
			TEST POINT		Other		
			A	B			
1	A247 TEST IDENT A 1 2 4 16 32 64 128	Connect equipment as shown in fig. 6-4. Chart recorder Controls: CHANNEL 1 V/DIV .5 CHANNEL 2 V/DIV .1 INPUT (both channels) OPR MARKER 1 SEC Set LINE switch to ON and adjust both PEN POSITION controls for zero pen marking at first major division at right side of scale. CHART SPEED 1 mm/sec			MATRIX SELECTOR 1 to position 10. MATRIX SELECTOR 2 to position 10. Signal generator control MAIN OUTPUT to left position POWER to ON		
2		Multimeter	45 (25)			+18.4 to +19.4 Vdc	Recheck test setup.
			8 (6)		RESET to OFF	+1.8 to +5.5 Vdc (Logic 1)	Recheck test setup.
			10 (8)			+1.8 to +5.5 Vdc (Logic 1)	Recheck test setup.
			40 (20)			+1.8 to +5.5 Vdc (Logic 1)	
			42 (22)			+1.8 to +5.5 Vdc (Logic 1)	
3		Multimeter: RANGE to 100	8 (6) 10 (8) 40 (20) 42 (22)		RESET to ON	-3.0 to +0.5 Vdc (Logic 0)	Recheck test setup.
4		Chart Recorder Controls CHANNEL 1 V/DIV .2 CHANNEL 2 V/DIV .1 CHART SPEED mm/SEC 5	9 (7) 11 (9) 41 (21) 43 (23)	9 (7) 9 (7) 9 (7) 9 (7)	Adjust signal generator for 0.5 Hz, square wave on chart recorder. Adjust AMPLITUDE control until square wave appears on chart recorder. Set CHART SPEED to STOP		Recheck test setup. Check signal generator.

Table 6-20. Relay Sense and K12 Operation Circuit Card 2A1A2A3, Test and Troubleshooting Procedures - Continued

Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication	Corrective action if indication abnormal
			TEST POINT		Other		
			A	B			
5		Multimeter	7 (5)	9 (7)	RESET to OFF	Logic 1 Logic 0	Check A1 gate.
6			7 (5)	9 (7)	RESET to ON	Logic 1	Check A1 gate.
7			13 (11)	9 (7)		Logic 1	Check A1 gate.
8			13 (11)	9 (7)	RESET to OFF	Logic 1 Logic 0	Check A1 gate.
9			39 (19)	9 (7)	RESET to OFF	+18.4 to +19.4 V - 0.5 to + 0.5 V	Check A2 gate, Q6, Q7, Q8, and Q9 stages.
10			39 (19)	9 (7)	RESET to ON	+18.4 to +19.4 Vdc	Check A2 gate, Q6, and Q9 stages.
11			47 (27)	9 (7)		+18.4 to +19.4 Vdc	Check A2 gate, Q6 and Q7 stages.
12			47 (27)	9 (7)	RESET to OFF	+18.4 to +19.4 Vdc - 0.5 to + 0.5 Vdc	Check A2 gate, Q6, and Q7 stages.
13			4 (2)	9 (7)		+18.4 to +19.4 Vdc - 0.5 to + 0.5 Vdc	Check Q10, and Q11 stages.
14			4 (2)	9 (7)	RESET to ON	+18.4 to +19.4 Vdc	Check Q10, and Q11 stages.
15	A248 TEST IDENT A 8 16 32 64 128		45 (25)			+18.4 to +19.4 Vdc	Recheck test setup.

Table 6-20. Relay Sense and K12 Operation Circuit Card 2A1A2A3, Test and Troubleshooting Procedures - Continued

Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication	Corrective action if indication abnormal
			TEST POINT		Other		
			A	B			
16			17 (15)			-3.0 to +0.5 Vdc (Logic 0)	Recheck test setup.
17			17 (15)		RESET to OFF	+1.8 to +5.5 Vdc (Logic 1)	Recheck test setup.
18		Chart Recorder CHART SPEED mm/SEC to 5	11 (9) 18 (16)	11 (9) 11 (9)	Adjust signal generator AMPLITUDE control for square wave on chart recorder. Set CHART SPEED to STOP.	 Equal to or less than 0.0 Vdc	Recheck test setup.
19		Multimeter	5 (3)	11 (9)		+18.4 to +19.4 Vdc 0.0 Vdc	Check A1, A3, A4, A5 gates and Q1, Q2, Q3, Q4, Q5 stages.
20			5 (3)	11 (9)	RESET to ON	+18.4 to +19.4 Vdc	Check A3, A4, A5 gates, and Q1, Q2 stages.
21		Chart Recorder Controls CHART SPEED mm/SEC 20	14 (12)	11 (9)	RESET to OFF	 CHANNEL 1 Logic 1 Logic 0 175 to 225 ms CHANNEL 2	Check A5 gate and Q3, Q4, Q5 stages. Check R20, C3.
22		Multimeter	14 (12)	11 (9)		Logic 1 Logic 0	Check A5 gate and Q3, Q4 Q5 stages.
23			12 (10)	11 (9)		Logic 1	Check A3, A4 and A5 gates.
24			46 (26)	11 (9)	RESET to ON	Logic 1	Check A4 and A5 gates.
25			46 (26)	11 (9)	RESET to OFF	Logic 1 Logic 0	Check A4 and A5 gates.

6-14. K6 Operation and Sequence Circuit Card 2A1A2A4.

a. Perform preparatory procedures described in paragraph 6-8.

b. Insert test adapter CP11 into test socket on the MX-8050.

c. Insert circuit card assembly into test adapter.

d. Depress POWER OFF/ON switch on MX-8050 to the ON position.

e. Depress PROFILE OFF/ON switch on MX-8050 to the OFF position.

f. Insert first test card (identified in test card column of table 6-21) into card reader, with clipped corner down and toward rear of test set.

g. Move card reader handle to right and observe that all power indicators on the MX-8050 test set are lit.

h. Observe that correct TEST IDENT indicators (identified in the test card column of table 6-21) are lit.

i. Refer to table 6-21 and perform test and troubleshooting procedures, changing the test card in the card reader as shown in the test card column. Refer to figure FO-17 schematic diagram as an aid in troubleshooting.

NOTE

Plug red stripe terminal of cable W85 connector into + red terminal of power supply.

j. Adjust power supply subassembly PP6323 (1A2A4) on AN/TPM-22 Radar Test Set between +18.8 to +19.0 Vdc output and use cable assembly W85 to connect the output to DC IN connector on the MX-8050 test set.

k. Upon completion of tests, remove test card by moving card reader handle to left, depress POWER OFF/ON switch to the OFF position, remove test adapter and circuit card assembly, and turn off the AN/TSM-100 and AN/TPM-22 test sets.

Table 6-21. K6 Operation and Sequence Circuit Card 2A1A2A4, Test and Troubleshooting Procedures

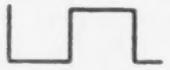
Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication	Corrective action if indication abnormal
			TEST POINT		Other		
			A	B			
1	A249 TEST IDENT A 1 8 16 32 64 128	Connect equipment as shown in fig. 6-4. Chart Recorder Controls CHANNEL 1 V/DIV .2 CHANNEL 2 V/DIV .1 INPUT (both channels) OPR CHART SPEED mm/SEC 1 MARKER 1 SEC Set LINE switch to ON and adjust both PEN POSITION controls at first major division from right side of scale.			MATRIX SELECTOR 1 to position 10. RESET to OFF		
2		Multimeter	38 (18) 38 (18)		RESET to ON	+1.8 to +5.5 Vdc (Logic 1) -3.0 to +0.5 Vdc (Logic 0)	Recheck test setup. Recheck test setup.
3		Chart Recorder Controls CHART SPEED mm/SEC 5	19 (17) 39 (19)	19 (17)	Adjust signal generator for 2.5 Hz square wave on chart recorder. Adjust AMPLITUDE control until square wave appears on chart recorder. Set CHART SPEED to STOP.	 3.5 to 3.8 Vdc 0.0 Vdc or less	Recheck test setup. Check signal generator.
4		Multimeter	43 (23)			+18.4 to +19.4 Vdc - 0.5 to + 0.5 Vdc	Check Q6 and Q7 stages.
5			41 (21)			+18.4 to +19.4 Vdc	Check A1 gate and Q4, Q5 stages.
6			41 (21)		RESET to OFF	+18.4 to +19.4 Vdc - 0.5 to + 0.5 Vdc	Check A1 gate and Q4, Q5 stages.

Table 6-21. K6 Operation and Sequence Circuit Card 2A1A2A4, Test and Troubleshooting Procedures - Continued

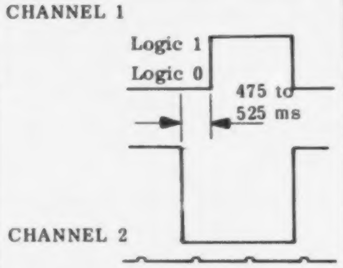
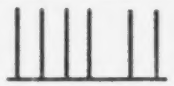
Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication	Corrective action if indication abnormal
			TEST POINT		Other		
			A	B			
7		Chart Recorder Controls CHART SPEED mm/SEC 20 Set CHART SPEED to STOP.	9 (7)			 CHANNEL 1 Logic 1 Logic 0 475 to 525 ms CHANNEL 2	Check A3, A4 gates and A1, A2, and A3 stages.
8		CHART SPEED mm/SEC 5 Set CHART SPEED to STOP.	9 (7)		RESET to ON	 Logic 1 momentarily then Logic 0.	Check A3gate.
9		Multimeter	7 (5)		RESET to OFF	Logic 1 Logic 0	Check A1 gate.
10			5 (3)			Logic 1	Check A2 gate.
11			5 (3)		RESET to ON	Logic 0	Check A2 gate.
12	A250 TEST IDENT A 2 8 16 32 64 128		38 (18)	39 (19)		Logic 0	Recheck test setup.
13			38 (18)	39 (19)	RESET to OFF	Logic 1	Recheck test setup.
14			18 (16)		TEST to 1 RESET to ON	Logic 1	Recheck test setup.

Table 6-21. K6 Operation and Sequence Circuit Card 2A1A2A4, Test and Troubleshooting Procedures - Continued

Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication	Corrective action if indication abnormal
			TEST POINT		Other		
			A	B			
15			18 (16)		TEST to 2	Logic 0	Recheck test setup.
16			39 (19)	39 (19)		+3.5 to 3.8 Vdc 0.0 Vdc or less	Recheck test setup. Check signal generator.
17			7 (5)		TEST to 1	Logic 1	Check A3, A4 gates.
18			7 (5)		TEST to 2	Logic 1	Check A3, A4 gates.
19			7 (5)		RESET to OFF	Logic 1 Logic 0	Check A3, A4 gates.
20	A251 TEST IDENT A 1 2 8 16 32 64 128		38 (18)			Logic 1	Recheck test setup.
21			38 (18)		RESET to ON	Logic 0	Recheck test setup.
22			17 (15)		TEST to 1	Logic 1	Recheck test setup.
23			17 (15)		TEST to 2	Logic 0	Recheck test setup.
24			39 (19)			+3.5 to +3.8 Vdc 0.0 Vdc or less	Recheck test setup. Check signal generator.
25			7 (5)		TEST to 1	Logic 1	Check A3 gate.
26			7 (5)		RESET to OFF	Logic 1	Check A3 gate.

Table 6-21. K6 Operation and Sequence Circuit Card 2A1A2A4, Test and Troubleshooting Procedures - Continued

Step	Test card	Test instrument controls and connections	MX-8050 controls TEST POINT A	MX-8050 controls TEST POINT B	MX-8050 controls Other	Normal indication	Corrective action if indication abnormal
27			7 (5)		RESET to ON TEST to 2	Logic 1	Check A3 gate.
28			7 (5)		RESET to OFF	Logic 1 Logic 0	Check A3 gate.

6-15. K8 Operation and Sequence Circuit Card 2A1A2A5.

a. Perform preparatory procedures described in paragraph 6-8.

b. Insert test adapter CP11 into test socket on the MX-8050.

c. Insert circuit card assembly into test adapter.

d. Depress POWER OFF/ON switch on MX-8050 to the ON position.

e. Depress PROFILE OFF/ON switch on MX-8050 to the OFF position.

f. Insert first test card (identified in test card column of table 6-22) into card reader, with clipped corner down and toward rear of test set.

g. Move card reader handle to right and observe that all power indicators on the MX-8050 test set are lit.

h. Observe that correct TEST IDENT indicators (identified in the test card column of table 6-22) are lit.

i. Refer to table 6-22 and perform test and troubleshooting procedures, changing the test card in the card reader as shown in the test card column. Refer to figure FO-18 schematic diagram as an aid in troubleshooting.

NOTE

Plug red stripe terminal of cable W85 connector into + red terminal of power supply.

j. Adjust power supply subassembly PP6323 (1A2A4) on AN/TPM-22 Radar Test Set between +18.8 to +19.0 Vdc output and use cable assembly W85 to connect the output to DC IN connector on the MX-8050 test set.

k. Upon completion of tests, remove test card by moving card reader handle to left, depress POWER OFF/ON switch to the OFF position, remove test adapter and circuit card assembly, and turn off the AN/TSM-100 and AN/TPM-22 test sets.

Table 6-22. K8 Operation and Sequence Circuit Card 2A1A2A5, Test and Troubleshooting Procedures

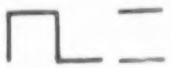
Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication	Corrective action if indication abnormal
			TEST POINT		Other		
			A	B			
1	A254 TEST IDENT A 2 4 8 16 32 64 128	Connect Equipment as shown in fig. 6-4. Chart Recorder Controls CHANNEL 1 V/DIV .2 CHANNEL 2 V/DIV .1 INPUT (both channels) OPR MARKER 1 SEC Set LINE switch to ON and adjust both PEN POSITION controls at first major division from right side of scale.			MATRIX SELECTOR 1 to position 10		
2		Multimeter	45 (25) 13 (11)		TEST to 1	+18.8 to +19.0 Vdc +1.8 to +5.5 Vdc (Logic 1)	Recheck test setup. Recheck test setup.
3			13 (11)		TEST to 2	-3.0 to +0.5 Vdc (Logic 0)	Recheck test setup.
4		Chart Recorder Controls CHART SPEED mm/SEC 20	5 (3) 11 (9)	5 (3)	Adjust signal generator for 0.5 Hz square wave on chart recorder. Adjust AMPLITUDE control until square wave appears on chart recorder. Set CHART SPEED to STOP.	 3.9 to 3.6 Vdc Equal to or less than 0.0 V.	Recheck test setup. Check signal generator.
5		Multimeter	7 (5)			Logic 1 3.5 Logic 0	Check A1 gate.
6			12 (10)			Logic 1 3.5 Logic 0	Check A1 gate.

Table 6-22. K8 Operation and Sequence Circuit Card 2A1A2A5, Test and Troubleshooting Procedures - Continued

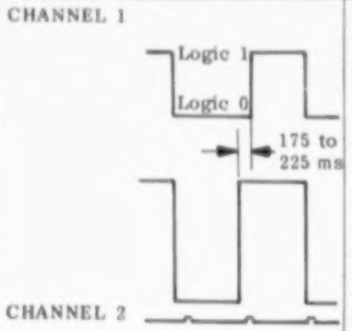
Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication	Corrective action if indication abnormal
			TEST POINT		Other		
			A	B			
7		Chart Recorder Controls CHART SPEED mm/SEC 20	19 (17)			 CHANNEL 1 Logic 1 Logic 0 175 to 225 ms CHANNEL 2	Check Q1, Q2, Q3 stages and A4 gate.
8		Multimeter	17 (15)			Logic 1 Logic 0	Check A4 and A3 gates.
9			47 (27)			+18.4 to +19.4 Vdc	Check A2 gate and Q3, Q4 and Q5 stages.
10			47 (27)		TEST to 1	+18.4 to +19.4 Vdc -0.5 to +0.5 Vdc	Check A2, A3 gates and Q3, Q4 and Q5 stages.
11	A255 **R1** TEST IDENT A 1 2 4 8 16 32 64 128		11 (9)			Logic 1	Check test setup.

Table 6-22. K8 Operation and Sequence Circuit Card 2A1A2A5, Test and Troubleshooting Procedures - Continued

Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication	Corrective action if indication abnormal
			TEST POINT		Other		
			A	B			
12			11 (9)		TEST to 2	Logic 0	Check test setup.
13			5 (3)	5 (3)		+1.8 to +5.5 Vdc -3.0 to +0.5 Vdc	Check test setup. Check signal generator.
14			39 (19)			Logic 1	Check A1, A2, A3, and A4 gates.
15			39 (19)		TEST to 1	Logic 1 Logic 0	Check A1, A2, A3, and A4 gates.

6-16. K11 Operation and Sequence Circuit Card 2A1A2A6.

a. Perform preparatory procedures described in paragraph 6-8.

b. Insert test adapter CP11 into test socket on the MX-8050.

c. Insert power panel circuit card assembly into test adapter.

d. Depress POWER OFF/ON switch on MX-8050 to the ON position.

e. Depress PROFILE OFF/ON switch on MX-8050 to the OFF position.

f. Insert first test card (identified in test card column of table 6-23) into card reader, with clipped corner down and toward rear of test set.

g. Move card reader handle to right and observe that all power indicators on the MX-8050 test set are lit.

h. Observe that correct TEST IDENT indicators (identified in the test card column of table 6-23) are lit.

i. Refer to table 6-23 and perform test and troubleshooting procedures, changing the test card in the card reader as shown in the test card column. Refer to figure FO-19 schematic diagram as an aid in troubleshooting.

NOTE

Plug red stripe terminal of cable W85 connector into + red terminal of power supply.

j. Adjust power supply subassembly PP6323 (1A2A4) on AN/TPM-22 Radar Test Set between +18.8 to +19.0 Vdc output and use cable assembly W85 to connect the output to DC IN connector on the MX-8050 test set.

k. Upon completion of tests, remove test card by moving card reader handle to left, depress POWER OFF/ON switch to the OFF position, remove test adapter and circuit card assembly, and turn off the AN/TSM-100 and AN/TPM-22 test sets.

Table 6-23. K11 Operation and Sequence Circuit Card 2A1A2A6, Test and Troubleshooting Procedures

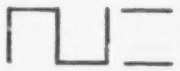
Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication	Corrective action if indication abnormal
			TEST POINT		Other		
			A	B			
1	A252 TEST IDENT A 4 8 16 32 64 128	Connect equipment as shown in fig. 6-4. Chart Recorder Controls CHANNEL 1 V/DIV .2 CHANNEL 2 V/DIV .1 INPUT (both channels) OPR MARKER 1 SEC Set LINE switch to ON and adjust both PEN POSITION controls at first major division from right side of scale.			MATRIX SELECTOR 1 to position 10.		
2		Multimeter	45 (25) 7 (5)		RESET to OFF	+18.9 to +19.0 Vdc +1.8 to +5.5 Vdc (Logic 1)	Recheck test setup. Recheck test setup.
3			7 (5)		RESET to ON	-3.0 to +0.5 Vdc (Logic 0)	Recheck test setup.
4			43 (23) 39 (19)		TEST to 1	Logic 1	Recheck test setup.
5			43 (23) 39 (19)	00 00	TEST to 2	Logic 0	Recheck test setup.
6		Chart Recorder Controls CHART SPEED mm/SEC 5	5 (3) 11 (9)	5 (3) 5 (3)	Set X.1 ONLY/NORMAL switch to X.1 ONLY. Adjust signal generator for 0.125 Hz square wave on chart recorder. Adjust AMPLITUDE control until square wave appears on chart recorder. Set CHART SPEED to STOP.	 +1.8 to +5.5 Vdc -3.0 to +0.5 Vdc	Recheck test setup. Check signal generator.

Table 6-23. K11 Operation and Sequence Circuit Card 2A1A2A6, Test and Troubleshooting Procedures - Continued

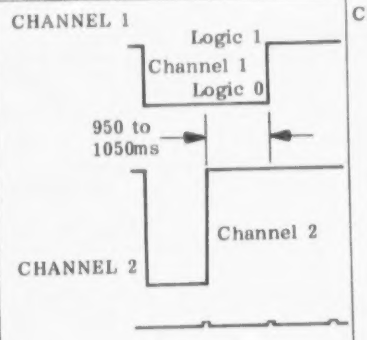
Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication	Corrective action if indication abnormal
			TEST POINT		Other		
			A	B			
7		Multimeter	46 (26)	5 (3)	RESET to ON	Logic 0	Check A4 and A5 gates.
8			38 (18)	5 (3)	TEST to 1	Logic 1	Check A3 gate.
9			8 (6)	5 (3)	RESET to OFF	Logic 1 Logic 0	Check A1, A2, A3, A4 gates and Q1, Q2, and Q3 stages.
10		Chart Recorder Controls CHART SPEED mm/SEC 20 CHART SPEED to OFF	8 (6)	5 (3)		 CHANNEL 1 Logic 1 Channel 1 Logic 0 950 to 1050ms Channel 2 CHANNEL 2	Check R7, C3.
11		Multimeter	47 (27)		RESET to ON	+18.4 to +19.4 Vdc (Check RESET-ON function through entire circuit.)	Check A5 gate and Q4 and Q5 stages.
12			47 (27)		RESET to OFF	-0.5 to +0.5 Vdc +18.4 to +19.4 Vdc +0.5 to -0.5 Vdc	Check A3 gate and Q4 and Q5 stages.
13			38 (18)	5 (3)	TEST to 2	(Check RESET-OFF function through entire circuit.) Logic 0	Check A3 gate.

Table 6-23. K11 Operation and Sequence Circuit Card 2A1A2A6, Test and Troubleshooting Procedures - Continued

Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication	Corrective action if indication abnormal
			TEST POINT		Other		
			A	B			
14			17 (15)	5 (3)	RESET to ON	Logic 1 Logic 0	Check A1 gate.
15	A253 TEST IDENT A 1 4 8 16 32 64 128		43 (23)		RESET to OFF	Logic 1	Recheck test setup.
16					RESET to ON	Logic 0	Recheck test setup.
17			41 (21)		TEST to 1	Logic 1	Recheck test setup.
18			41 (21)		TEST to 2	Logic 0	Recheck test setup.
19			45 (25)			+18.4 to +19.4 Vdc	Recheck test setup.
20			9 (7)	9 (7)		+1.8 to +5.5 Vdc -3.0 to +0.5 Vdc	Recheck test setup. Check signal generator.
21			38 (18)	9 (7)		Logic 0	Check A3 gate.
22			38 (18)	9 (7)	RESET to OFF	Logic 1	Check A3 gate.
23			18 (16)	9 (7)	TEST to 1	Logic 1 Logic 0	Check A1, A2 and A3 gates.

6-17. Relay Time Circuit Card 2A1A2A7.

a. Perform preparatory procedures described in paragraph 6-8.

b. Insert test adapter CP11 into test socket on the MX-8050.

c. Insert circuit card assembly into test adapter.

d. Depress POWER OFF/ON switch on MX-8050 to the ON position.

e. Depress PROFILE OFF/ON switch on MX-8050 to the OFF position.

f. Insert first test card (identified in test card column of table 6-24) into card reader, with clipped corner down and toward rear of test set.

g. Move card reader handle to right and observe that all power indicators on the MX-8050 test set are lit.

h. Observe that correct TEST IDENT indicators (identified in the test card column of table 6-24) are lit.

i. Refer to table 6-24 and perform test and troubleshooting procedures, changing the test card in the card reader as shown in the test card column. Refer to figure FO-20 schematic diagram as an aid in troubleshooting.

j. Upon completion of tests, remove test card by moving card reader handle to left, depress POWER OFF/ON switch to the OFF position, remove test adapter and circuit card assembly, and turn off the AN/TSM-100 and AN/TPM-22 test sets.

Table 6-24. Relay Time Circuit Card 2A1A2A7, Test and Troubleshooting Procedures

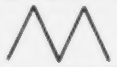
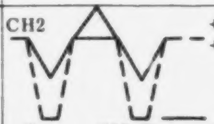
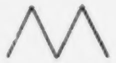
Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication	Corrective action if indication abnormal
			TEST POINT		Other		
			A	B			
1	B1 TEST IDENT B 1	Oscilloscope Connect: Input CH1 to test point B Input CH2 to test point A Probe grounds to GRD 2 Using cable W9 connect EXT TRIG INPUT to test point B (coax). Controls: VERT MODE to CHOP A TRIGGER SOURCE to EXT A TRIG MODE to NORM TIM/DIV to 1 ms VOLTS/DIV CH1 to 1 VOLTS/DIV CH2 to 1	5 (3)	5 (3)	Adjust signal generator for 500 Hz triangular wave on oscilloscope.	CH 1 and CH 2  4.8 to 5.2 Vp-p Freq: 500 Hz	Recheck test setup.
2		Controls: CH2 VOLTS/DIV to 5	4 (2)	5 (3)		CH2  +24.5 to +25.5 V 0.0 V Freq: 500 Hz	Check Q1 stage.
3			7 (5)	5 (3)		Same as step 2. Waveform may vary within limit of dotted line.	Check Q2 stage.
4			10 (8)	5 (3)		Same as step 2.	Check Q3 stage.
5			13 (11)	5 (3)		Same as step 2.	Check Q4 stage.
6			17 (15)	5 (3)		Same as step 2.	Check Q5 stage.
7	B2 TEST IDENT B 2	CH2 VOLTS/DIV to 1	57	57	Adjust signal generator for 250 Hz triangular wave on oscilloscope.	CH 1 and CH 2  4.9 to 5.1 Vp-p Freq: 250 Hz	Recheck test setup.

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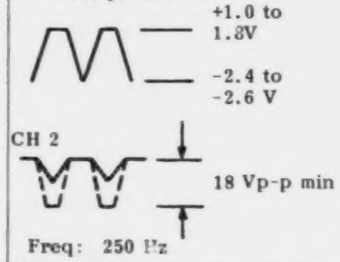
Table 6-24. Relay Time Circuit Card 2A1A2A7, Test and Troubleshooting Procedures - Continued

Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication	Corrective action if indication abnormal
			TEST POINT		Other		
			A	B			
8		Controls: VOLTS/DIV CH1 to 1 VOLTS/DIV CH2 to 5	18 (16)	19 (17)	MATRIX SELECTOR 1 to position 10. MATRIX SELECTOR 2 to position 10.	CH 1 Freq: 250 Hz  Freq: 250 Hz	Check Q6 stage.
9	B3 TEST IDENT B 1 2		38 (18)	39 (19)		Same as step 8.	Check Q7 stage.
10	B4 TEST IDENT B 4		40 (20)	41 (21)		Same as step 8.	Check Q8 stage.
11	B5 TEST IDENT B 1 4		42 (22)	43 (23)		Same as step 8.	Check Q9 stage.

6-18. Noise Suppression Circuit Card 2A1A2A8.

a. Perform preparatory procedures described in paragraph 6-8.

b. Insert test adapter CP11 into test socket on the MX-8050.

c. Insert circuit card assembly into test adapter.

d. Depress POWER OFF/ON switch on MX-8050 to the ON position.

e. Depress PROFILE OFF/ON switch on MX-8050 to the OFF position.

f. Insert first test card (identified in test card column of table 6-25) into card reader, with clipped corner down and toward rear of test set.

g. Move card reader handle to right and observe that all power indicators on the MX-8050 test set are lit.

h. Observe that correct TEST IDENT indicators (identified in the test card column of table 6-25) are lit.

i. Refer to table 6-25 and perform test and troubleshooting procedures, changing the test card in the card reader as shown in the test card column. Refer to figure FO-21 schematic diagram as an aid in troubleshooting.

j. Upon completion of tests, remove test card by moving card reader handle to left, depress POWER OFF/ON switch to the OFF position, remove test adapter and circuit card assembly, and turn off the AN/TSM-100 and AN/TPM-22 test sets.

Table 6-25. Noise Suppression Circuit Card 2A1A2A8, Test and Troubleshooting Procedures

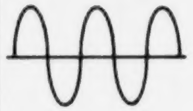
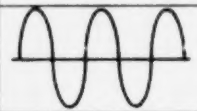
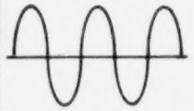
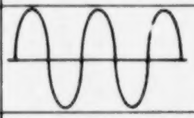
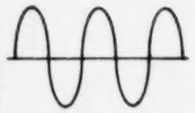
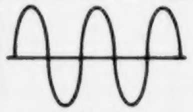
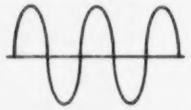
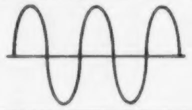
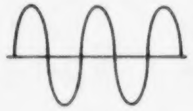
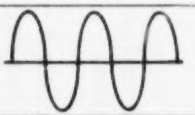
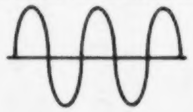
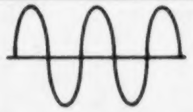
Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication	Corrective action if indication abnormal
			TEST POINT		Other		
			A	B			
1	B159 TEST IDENT B 1 2 4 8 16 128	Oscilloscope Connect: Input CH1 to test point A Using cable W9 connect EXT TRIG to test point B (coax). Controls: A TRIGGER SOURCE to EXT A TRIG MODE to NORM TIME/DIV to .5ms VOLT/DIV CH1 to .5 VERT MODE to CH1	17 (15) 14 (12)	17 (15)	MATRIX SELECTOR 1 to position 12. MATRIX SELECTOR 2 to position 12. Adjust signal generator for 1 kHz sinewave signal.	 2.2 to 2.8 Vp-p.	Recheck test setup.
2			14 (12) 17 (15)		MATRIX SELECTOR 1 to position 7. MATRIX SELECTOR 2 to position 7.	 1.0 to 2.0 Vp-p.	Check C11, C12.
3	B160 TEST IDENT B 32 128		19 (17) 18 (16)	19 (17)	MATRIX SELECTOR 1 to position 12. MATRIX SELECTOR 2 to position 12.	 2.2 to 2.8 Vp-p.	Recheck test setup.
4			18 (16) 19 (17)		MATRIX SELECTOR 1 to position 7. MATRIX SELECTOR 2 to position 7.	 1.0 to 2.0 Vp-p.	Check C9, C10.
5	B161 TEST IDENT B 1 32 128		40 (20) 38 (18)	40 (20)	MATRIX SELECTOR 1 to position 12. MATRIX SELECTOR 2 to position 12.	 2.2 to 2.8 Vp-p.	Recheck test setup.
6			38 (18) 40 (20)		MATRIX SELECTOR 1 to position 7. MATRIX SELECTOR 2 to position 7.	 1.0 to 2.0 Vp-p.	Check C6, C8.

Table 6-25. Noise Suppression Circuit Card 2A1A2A8, Test and Troubleshooting Procedures - Continued

Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication	Corrective action if indication abnormal
			TEST POINT		Other		
			A	B			
7	B162 TEST IDENT B 2 32 128		41 (21) 42 (22)	41 (21)	MATRIX SELECTOR 1 to position 12. MATRIX SELECTOR 2 to position 12.	 2.2 to 2.8 Vp-p.	Recheck test setup.
8			42 (22) 41 (21)		MATRIX SELECTOR 1 to position 7. MATRIX SELECTOR 2 to position 7.	 1.0 to 2.0 Vp-p.	Check C4, C5.
9	B163 TEST IDENT B 1 2 32 128		43 (23) 46 (26)	43 (23)	MATRIX SELECTOR 1 to position 12. MATRIX SELECTOR 2 to position 12.	 2.2 to 2.8 Vp-p.	Recheck test setup.
10			46 (26) 43 (23)		MATRIX SELECTOR 1 to position 7. MATRIX SELECTOR 2 to position 7.	 1.0 to 2.0 Vp-p.	Check C2, C3.
11	B164 TEST IDENT B 4 32 128		47 (27)	47 (27)	MATRIX SELECTOR 1 to position 12. MATRIX SELECTOR 2 to position 12.	 2.2 to 2.8 Vp-p.	Recheck test setup.
12			47 (27)		MATRIX SELECTOR 1 to position 7. MATRIX SELECTOR 2 to position 7.	 1.0 to 2.0 Vp-p.	Check C1.

6-19. Servo Amplifier Circuit Card 2A2A2A1.

a. Perform preparatory procedures described in paragraph 6-8.

b. Insert test adapter CP11 into test socket on the MX-8050.

c. Insert circuit card assembly into test adapter.

d. Depress POWER OFF/ON switch on MX-8050 to the ON position.

e. Depress PROFILE OFF/ON switch on the MX-8050 to the OFF position.

f. Insert first test card (identified in test card column of table 6-26) into card reader, with clipped corner down and toward rear of test set.

g. Move card reader handle to right and observe that all power indicators on the MX-8050 test set are lit.

h. Observe that correct TEST IDENT indicators (identified in the test card column of table 6-26) are lit.

i. Refer to table 6-26 and perform test and troubleshooting procedures, changing the test card in the card reader as shown in the test card column. Refer to figure FO-22 schematic diagram as an aid in troubleshooting.

j. Upon completion of tests, remove test card by moving card reader handle to left, depress POWER OFF/ON switch to the OFF position, remove test adapter and circuit card assembly, and turn off the AN/TSM-100 and AN/TPM-22 test sets.

Table 6-26. Servo Amplifier Circuit Card 2A2A2A1, Test and Troubleshooting Procedures

Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication			Corrective action if indication abnormal
			TEST POINT		Other				
			A	B		Min.	Nom.	Max.	
1	B37 TEST IDENT B 1 4 32	Multimeter Connect cable W283 Red probe to test point A Black probe to test point B Controls: FUNCTION to KΩ RANGE to 100	18 (16)	17 (15)		3.25k ohms	3.32k ohms	3.39k ohms	Check R8.
2		RANGE to 1000	14 (12)	17 (15)		295.61k ohms	302.21k ohms	308.71k ohms	Check R3, R6.
3		RANGE to 100	6 (4)	5 (3)		3.25k ohms	3.32k ohms	3.39k ohms	Check R9.
4		RANGE to 1000	8 (6)	6 (4)		295.61k ohms	302.21k ohms	308.71k ohms	Check R4, R7.
5		RANGE to 100	38 (18)	19 (17)		5.38k ohms	5.49k ohms	5.60k ohms	Check R10.
6			40 (20)	39 (19)		5.38k ohms	5.49k ohms	5.60k ohms	Check R11.
7	B26 TEST IDENT B 2 8 16	FUNCTION to DC RANGE to AUTO	8 (6)	3 (1)	MATRIX SELECTOR 1 to position 8.	+7.70 Vdc	+7.95 Vdc	+8.20 Vdc	Check CR2 (forward direction).
8			14 (12)	3 (1)	MATRIX SELECTOR 2 to position 8.	+7.70 Vdc	+7.95 Vdc	+8.20 Vdc	Check CR1 (forward direction).
9	B27 TEST IDENT B 1 2 8 16		8 (6)	3 (1)		-12.56 Vdc	-12.90 Vdc	-13.21 Vdc	Check CR2 (reverse direction), CR4 (forward direction).

Table 6-26. Servo Amplifier Circuit Card 2A2A2A1, Test and Troubleshooting Procedures - Continued

Step	Test card	Test instrument controls and connections	MX-8050 controls TEST POINT A	MX-8050 controls TEST POINT B	MX-8050 controls Other	Normal indication Min.	Normal indication Norm.	Normal indication Max.	Corrective action if indication abnormal
10			43 (23)	3 (1)		-0.4 Vdc	-0.6 Vdc	-0.8 Vdc	Check CR5 (forward direction).
11	B28 TEST IDENT B 4 8 16		14 (12)	3 (1)		-12.56 Vdc	-12.90 Vdc	-13.21 Vdc	Check CR3 (forward direction), CR1 (reverse direction).
12			46 (26)	3 (1)		-0.4 Vdc	-0.6 Vdc	-0.8 Vdc	Check CR6 (forward direction).
13	B29 TEST IDENT B 1 4 8 16		43 (23)	3 (1)		+14.8 Vdc	+15.0 Vdc	+15.2 Vdc	Check CR5, CR6 (reverse direction).
14		Disconnect probes	11 (9)	3 (1)		-14.8 Vdc	-15.0 Vdc	-15.2 Vdc	Check CR3, CR4 (reverse direction).

6-20. Range and Range Rate Generator Circuit Card 2A2A6A1.

a. Perform preparatory procedures described in paragraph 6-8.

b. Insert test adapter CP5 into test socket on the MX-8050.

c. Insert circuit card assembly into test adapter.

d. Depress POWER OFF/ON switch on MX-8050 to the ON position.

e. Depress PROFILE OFF/ON switch on MX-8050 to the OFF position.

f. Insert first test card (identified in test card column of table 6-27) into card reader, with clipped corner down and toward rear of test set.

g. Move card reader handle to right and observe that all power indicators on the MX-8050 test set are lit.

h. Observe that correct TEST IDENT indicators (identified in the test card column of table 6-27) are lit.

i. Refer to table 6-27 and perform test and troubleshooting procedures, changing the test card in the card reader as shown in the test card column. Refer to figure FO-23 schematic diagram as an aid in troubleshooting.

j. Upon completion of tests, remove test card by moving card reader handle to left, depress POWER OFF/ON switch to the OFF position, remove test adapter and circuit card assembly, and turn off the AN/TSM-100 and AN/TPM-22 test sets.

Table 6-27. Range and Range Rate Generator Circuit Card 2A2A6A1, Test and Troubleshooting Procedures

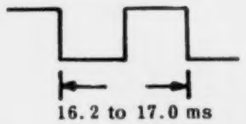
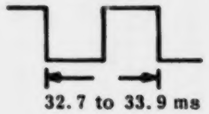
Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication	Corrective action if indication abnormal
			TEST POINT		Other		
			A	B			
1	A65 TEST IDENT A 1 64	Adapter CP5 Oscilloscope Connect: Input CH1 to test point A Input CH2 to test point B Controls: VERT MODE to CH1 VOLTS/DIV to 2 TIME/DIV to 5ms SOURCE to CH1 TRIG MODE to AUTO Using cable W9 connect test jack B (coax) to CHANNEL A input of counter. Counter control settings: FUNCTION to PERIOD A GATE TIME to 1S DISPLAY POSITION to AUTO CHECK/COM A/SEP to SEP Impedance to 1MΩ ATTEN to X10 AC/DC to DC LEVEL, Adjust as necessary	5	24, 25 26	PROFILE to OFF TEST to 1 RESET to OFF	——— Logic 1	Recheck test setup.
2			5	26	TEST to 2	CH1 ——— Logic 0	Recheck test setup.
3			6	26	TEST to 2	CH1 ——— Logic 1	Recheck test setup.
4			6	26	TEST to 1	CH1 ——— Logic 0	Recheck test setup.
5		Oscilloscope VOLTS/DIV CH2 to 2 VERT MODE to CHOP TRIG MODE to NORM	52	52	RESET to ON TEST to 1	58.82 to 67.728 Hz 	Adjust potentiometer 2A2A6R3, Check 24, 29, 21, 22, 23, 26.
6		Oscilloscope TIME/DIV to 10 ms	51	51		29.498 to 30.581 Hz 	Same as step 5

Table 6-27. Range and Range Rate Generator Circuit Card 2A2A6A1, Test and Troubleshooting Procedures - Continued

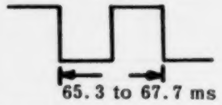
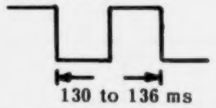
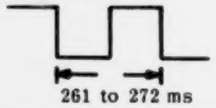
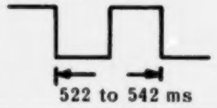
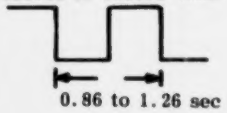
Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication	Corrective action if indication abnormal
			TEST POINT		Other		
			A	B			
7			55	55		14.771 to 15.313 Hz  	Same as step 5.
8		Oscilloscope TIME/DIV to 20 ms	56	56		7.353 to 7.692 Hz  	Same as step 5.
9		Oscilloscope TIME/DIV to 50 ms	54	54		3.690 to 3.831 Hz  	Same as step 5.
10		Oscilloscope TIME/DIV to .1s	53	53		1.845 to 1.915 Hz  	Same as step 5.
11		Oscilloscope TIME/DIV to .2s NOTE For steps 11 through 14 allow counter to count for approximately 30 seconds.	49	49		.925.92 to .96153 MHz  	Same as step 5.

Table 6-27. Range and Range Rate Generator Circuit Card 2A2A6A1, Test and Troubleshooting Procedures - Continued

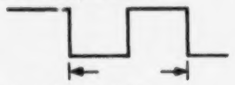
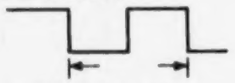
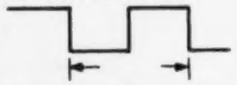
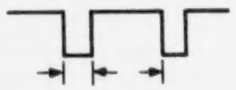
Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication	Corrective action if indication abnormal
			TEST POINT		Other		
			A	B			
12		Oscilloscope TIME/DIV to .5s	50	50		462.96 to 480.76 MHz  2.08 to 2.16 sec	Same as step 5.
13		Counter GATE TIME to 10s	47	47		230.94 to 239.80 MHz  4.17 to 4.33 sec	
14			46	46		115.34 to 119.76 MHz  8.35 to 8.67 sec	
15		Disconnect oscilloscope test probe from test jack A and connect to circuit card points. Z4 pins 4 and 8.		26	RESET to OFF TEST to 2	Logic 1	Check test setup.
16		Oscilloscope TIME/DIV to .5ms Test probe to Z4 pin 3.				 .5ms 1.6ms	Replace Z4
17		Test probe to Z13 pin 11.			TEST to 2 RESET to ON	Logic 0 Logic 1	Replace Z13
18		Test probe to Z13 pin 14.			RESET to OFF	Logic 0 Logic 1	Replace Z13
19		Test probe to Z10 pin 3.			RESET ON TEST 1	Logic 0 Logic 1	Replace Z10

Table 6-27. Range and Range Rate Generator Circuit Card 2A2A6A1, Test and Troubleshooting Procedures - Continued

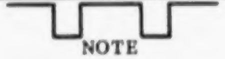
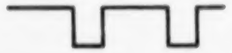
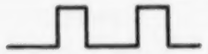
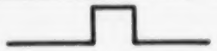
Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication	Corrective action if indication abnormal
			TEST POINT		Other		
			A	B			
20		Test probe to Z15 pin 6.			TEST to 2	Logic 1 Logic 0	Replace Z15
21		Test probe to Z9 pin 6.			TEST to 1	Logic 0 Logic 1	Replace Z9
22		Test probe to Z9 pin 11.			TEST to 1 RESET to OFF TEST toggle RESET to ON	 NOTE Waveform will appear for approximately 8 seconds. Logic 1	Replace Z9. NOTE To reset circuit after waveform has disappeared press RESET to OFF and wait until logic 1 changes to logic 0.
23		Test probe to Z9 pin 14.			TEST to 2	 Logic 1	Replace Z9.
24		Test probe to Z9 pin 3.			RESET to OFF	 After approximately 4 to 15 seconds Logic 1	Replace Z9
25		Oscilloscope TIME/DIV to 1ms Test probe to Z14 pin 11.			RESET to OFF TEST to 2 TEST toggle RESET to ON	Logic 1 Pulse appears every 8 seconds	Check Z14 and Z16. Replace if defective.
26		Test probe to Z11 pin 11.				Logic 1	Replace Z11.
27		Test probe to Z11 pin 14.				 Pulse appears every 8 seconds	Replace Z11.

Table 6-27. Range and Range Rate Generator Circuit Card 2A2A6A1, Test and Troubleshooting Procedures - Continued

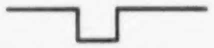
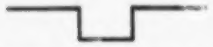
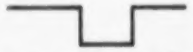
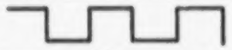
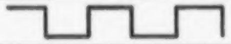
Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication	Corrective action if indication abnormal
			TEST POINT A	TEST POINT B	Other		
28		Test probe to Z11 pin 7.			TEST to 1	Logic 0 Logic 1	Replace Z11.
29		Test probe to Z5 pin 4.				 Pulse appears every 8 seconds	Replace Z5.
30		Test probe to Z5 pin 5.				Logic 0	Replace Z5
31		Test probe to Z12 pin 14.				 Pulse appears every 8 seconds	Replace Z12.
32		Test probe to Z12 pin 7.			TEST to 2	 Pulse appears every 8 seconds	Replace Z12.
33		Test probe to Z8 pin 3.			RESET to OFF	Logic 1 After 8 seconds Logic 0	Replace Z8.
34		Test probe to Z13 pin 3 Oscilloscope TIME/DIV to 2ms			RESET to ON		Replace Z13.
		Test probe to Z15 pin 8.					Replace Z15.
35	A66 TEST IDENT A 2 64	Oscilloscope Connect: Input CH1 to test point A Input CH2 to test point B	6	26	PROFILE to OFF TEST to 2	Logic 1	Recheck test setup.

Table 6-27. Range and Range Rate Generator Circuit Card 2A2A6A1, Test and Troubleshooting Procedures - Continued

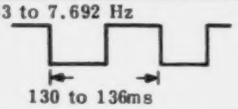
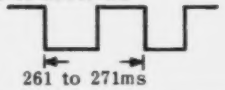
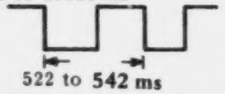
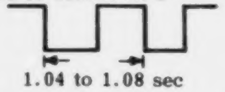
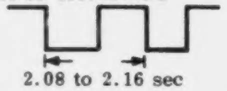
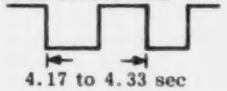
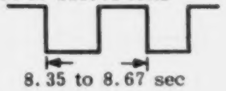
Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication	Corrective action if indication abnormal
			TEST POINT		Other		
			A	B			
36		Counter GATE TIME to 1s Oscilloscope TIME/DIV to 20ms	19	19		7.353 to 7.692 Hz 	Check Z1, Z2, Z3, and Z9. Adjust R3 if necessary.
37		Oscilloscope TIME/DIV to 50ms	17	17		3.690 to 3.831 Hz 	Check Z1, Z2, Z3, and Z9. Adjust R3 if necessary.
38		Oscilloscope TIME/DIV to .1s	15	15		1.845 to 1.915 Hz 	Check Z1, Z2, Z3, and Z9. Adjust R3 if necessary.
39		Oscilloscope TIME/DIV to .2s	41	41		925.92 to 961.53 MHz 	Check Z1, Z2, Z3, and Z9. Adjust R3 if necessary.
40		Oscilloscope TIME/DIV to .5s	43	43		462.96 to 480.76 MHz 	Check Z1, Z2, Z3, and Z9. Adjust R3 if necessary.
41		Counter GATE TIME to 10s NOTE Allow a minimum of 30 seconds for a response.	40	40		230.94 to 239.80 MHz 	Check Z1, Z2, Z3, and Z9. Adjust R3 if necessary.
42			39	39		115.34 to 119.76 MHz 	Check Z1, Z2, Z3, and Z9. Adjust R3 if necessary.

Table 6-27. Range and Range Rate Generator Circuit Card 2A2A6A1, Test and Troubleshooting Procedures - Continued

Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication	Corrective action if indication abnormal
			TEST POINT		Other		
			A	B			
43		Disconnect cable W9 from counter	9	24	RESET to ON TEST to 1 TEST to 2	CH1 ——— Logic 0 ——— Logic 1	Check Z6, Z8, Z13. Replace defective component.
44			13	24	TEST to 1 TEST to 2	——— Logic 1 ——— Logic 0	Check Z6, Z8, Z13. Replace defective component.

6-21. Range D/A Converter Circuit Card 2A2A6A2.

a. Perform preparatory procedures described in paragraph 6-8.

b. Insert test adapter CP5 into test socket on the MX-8050.

c. Insert circuit card assembly into test adapter.

d. Depress POWER OFF/ON switch on MX-8050 to the ON position.

e. Depress PROFILE OFF/ON switch on MX-8050 to the OFF position.

f. Insert first test card (identified in test card column of table 6-28) into card reader, with clipped corner down and toward rear of test set.

g. Move card reader handle to right and observe that all power indicators on the MX-8050 test set are lit.

h. Observe that correct TEST IDENT indicators (identified in the test card column of table 6-28) are lit.

i. Refer to table 6-28 and perform test and troubleshooting procedures, changing the test card in the card reader as shown in the test card column. Refer to figure FO-24 schematic diagram as an aid in troubleshooting.

j. Upon completion of tests, remove test card by moving card reader handle to left, depress POWER OFF/ON switch to the OFF position, remove test adapter and circuit card assembly, and turn off the AN/TSM-100 and AN/TPM-22 test sets.

Table 6-28. Range D/A Converter Circuit Card 2A2A6A2, Test and Troubleshooting Procedure

Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication	Corrective action if indication abnormal
			TEST POINT		Other		
			A	B			
1	A30 TEST IDENT A 2 4 8 16	Multimeter Connect: Ratio test cable W282 +INPUT probe to test jack A -INPUT probe to GND 1 Controls: FUNCTION to DC RANGE to AUTO Insert Test Adapter CP6 into socket A and B of MX-8050. Insert 2A2A6A2 circuit card in CP6.	2		RESET to ON	-0.8 to +0.4 Vdc	Troubleshoot MX-8050. Check and replace (if defective) Z1, Z2, Z3, and associated circuitry.
			2		RESET to OFF	+2.0 to +5.5 Vdc	
			4		TEST to 1	+2.0 to +5.5 Vdc	
			4		TEST to 2	-0.8 to +0.4 Vdc	
			5		TEST to 1	+2.0 to +5.5 Vdc	
			5		TEST to 2	-0.8 to +0.4 Vdc	
			6		TEST to 1	+2.0 to +5.5 Vdc	
			6		TEST to 2	-0.8 to +0.4 Vdc	
			9		RESET to ON	-0.8 to +0.4 Vdc	
			9		RESET to OFF	+2.0 to +5.5 Vdc	
			11		RESET to ON	-0.8 to +0.4 Vdc	
			11		RESET to OFF	+2.0 to +5.5 Vdc	
			15		TEST to 1	+2.0 to +5.5 Vdc	
			15		TEST to 2	-0.8 to +0.4 Vdc	
			17		TEST to 1	+2.0 to +5.5 Vdc	
			17		TEST to 2	-0.8 to +0.4 Vdc	
			18		RESET to ON	-0.8 to +0.4 Vdc	
			18		RESET to OFF	+2.0 to +5.5 Vdc	
			33		TEST to 1	+2.0 to +5.5 Vdc	
			33		TEST to 2	-0.8 to +0.4 Vdc	
			12			-9.9 to -10.1 Vdc	
2			41		RESET to OFF TEST to 1	+19.00 to +21.00 Vdc	Proceed to step 3.
					RESET to ON TEST to 2	-0.50 to +0.50 Vdc	
3		Disconnect multimeter + INPUT probe from test jack A and connect to circuit card test points.	41		RESET to OFF TEST to 1		
		TP4				+2.0 to +2.5 Vdc	Check and replace (if defective) Q1 and CR1.
		Z1, pins 6, 7, 8, 9				-9.0 to -11.0 Vdc	Check and replace (if (defective) Z1.

Table 6-28. Range D/A Converter Circuit Card 2A2A6A2, Test and Troubleshooting Procedure - Continued

Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication	Corrective action if indication abnormal
			TEST POINT		Other		
			A	B			
4		+ INPUT probe to Z4 pins 6, 7, 8, 9	41			-9.0 to -11.0 Vdc	Check and replace (if defective) Z4.
5		+ INPUT probe to Z7 pin 6	41			-9.0 to -11.0 Vdc	Check and replace (if defective) Z7A.
6		+ INPUT probe to Z2 pins 6, 7, 8, 9	41			-9.0 to -11.0 Vdc	Check and replace (if defective) Z2.
7		+ INPUT probe to Z5 pins 6, 7, 8, 9	41			-9.0 to -11.0 Vdc	Check and replace (if defective) Z5.
8		+ INPUT probe to Z7 pin 6	41			-7.0 to -8.0 Vdc	Check and replace (if defective) Z7B.
9		+ INPUT probe to Z3 pins 8, 9	41			-9.0 to -11.0 Vdc	Check and replace (if defective) Z3.

Table 6-28. Range D/A Converter Circuit Card 2A2A6A2, Test and Troubleshooting Procedure - Continued

Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication	Corrective action if indication abnormal
			TEST POINT		Other		
			A	B			
10		+ INPUT probe to Z6 pins 6, 8, 9	41			-9.0 to -11.0 Vdc	Check and replace (if defective) Z6.
11		+ INPUT probe to Z7, pin 4 pin 7	41			 +19.0 to +21.0 Vdc 0 Vdc	Check and replace (if defective) Z7C, AR2 or associated circuitry.
12		+ INPUT probe to Z1 pins 6, 7, 8, 9	41			+0.5 to 0.9 Vdc	Check and replace (if defective) Z1.
13		+ INPUT probe to Z4 pins 6, 7, 8, 9	41			0 Vdc	Check and replace (if defective) Z4.
14		+ INPUT probe to Z7 pin 6	41			0 Vdc	Check and replace (if defective) Z7A.
15		+ INPUT probe to Z2 pins 6, 7, 8, 9	41			+0.5 to 0.9 Vdc	Check and replace (if defective) Z2.

Table 6-28. Range D/A Converter Circuit Card 2A2A6A2, Test and Troubleshooting Procedure - Continued

Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication	Corrective action if indication abnormal
			TEST POINT		Other		
			A	B			
16		+ INPUT probe to Z5 pins 6, 7, 8, 9	41			0 Vdc	Check and replace (if defective) Z5.
17		+ INPUT probe to Z7 pin 6	41			0 Vdc	Check and replace (if defective) Z7B.
18		+ INPUT probe to Z3 pins 8, 9	41			+0.5 to +0.9 Vdc	Check and replace (if defective) Z3.
19		+ INPUT probe to Z6 pins 8, 9	41			0 Vdc	Check and replace (if defective) Z6.
20		+ INPUT probe to test jack A	41			-0.50 to +0.50 Vdc	Check and replace (if defective) AR2.
21			39			+19.8 to +20.2 Vdc	Check and replace (if defective) AR1.
22		Multimeter controls MODE switch to RATIO ON	41	39	RESET to OFF TEST to 1	0.923 to 1.23 ratio	Adjust 4A16R4 for ratio of 1.023 ± 0.005.
		Connect multimeter +RATIO lead to test jack B, -RATIO lead to GRD 1	41	39	RESET to ON	0.000 to 1.001 ratio	
			41	39	RESET to OFF TEST to 2	0.021 to 0.25 ratio	

6-22. Range Rate D/A Converter Circuit Card 2A2A6A3.

a. Perform preparatory procedures described in paragraph 6-8.

b. Insert test adapter CP6 into test socket on the MX-8050.

c. Insert circuit card assembly into test adapter.

d. Depress POWER OFF/ON switch on MX-8050 to the ON position.

e. Depress PROFILE OFF/ON switch on MX-8050 to the OFF position.

f. Insert first test card (identified in test card column of table 6-29) into card reader, with clipped corner down and toward rear of test set.

g. Move card reader handle to right and observe that all power indicators on the MX-8050 test set are lit.

h. Observe that correct TEST IDENT indicators (identified in the test card column of table 6-29) are lit.

i. Refer to table 6-29 and perform test and troubleshooting procedures, changing the test card in the card reader as shown in the test card column. Refer to figure FO-25 schematic diagram as an aid in troubleshooting.

j. Upon completion of tests, remove test card by moving card reader handle to left, depress POWER OFF/ON switch to the OFF position, remove test adapter and circuit card assembly, and turn off the AN/TSM-100 and AN/TPM-22 test sets.

Table 6-29. Range Rate D/A Converter Circuit Card 2A2A6A3, Test and Troubleshooting Procedure

Step	Test card	Test instrument controls and connections	MX-8050 controls: TEST POINT A	MX-8050 controls: TEST POINT B	MX-8050 controls: Other	Normal indication	Corrective action if indication abnormal
1	A31	Multimeter	2	24	TEST to 1	+2.0 to +5.5 Vdc	Troubleshoot MX-8050. Check and replace (if defective) Z1 and Z2 and associated circuitry.
			2	24	TEST to 2	-0.8 to +0.4 Vdc	
		Connect cable W283:					
	TEST		4	24	RESET to ON	-0.8 to +0.4 Vdc	
	IDENT	Red probe to test jack A	4	24	RESET to OFF	+2.0 to +5.5 Vdc	
	A	Black probe to test jack B	6	24		+2.0 to +5.5 Vdc	
	1		6	24	RESET to ON	-0.8 to +0.4 Vdc	
	2	Controls:					
	4	Function to DC	42	24		-0.8 to +0.4 Vdc	
	8		42	24	RESET to OFF	+2.0 to +5.5 Vdc	
	16	RANGE to AUTO	44	24	RESET to ON	-0.8 to +0.4 Vdc	
		Insert test adapter CP6 into socket A and B of MX-8050.	44	24	RESET to OFF	+2.0 to +5.5 Vdc	
		Insert 2A2A6A3 circuit card in adapter CP6.	46	24	RESET to ON	-0.8 to +0.4 Vdc	
			46	24	RESET to OFF	+2.0 to +5.5 Vdc	
			51	24	TEST to 1	+2.0 to +5.5 Vdc	
			51	24	TEST to 2	-0.8 to +0.4 Vdc	
			52	24	TEST to 1	+2.0 to +5.5 Vdc	
			52	24	TEST to 2	-0.8 to +0.4 Vdc	
2			12,14	13		-9.99 to -10.01 Vdc	Adjust R4 of circuit card. Check and replace (if defective) AR1.
3			16	13		+9.85 to +10.15 Vdc	Check and replace (if defective) AR2 or associated circuitry.
4		Disconnect multimeter test probe from test jack A and connect to circuit card test point TP4			RESET to OFF TEST to 2	+2.0 to +2.5 Vdc	Check and replace (if defective) Q2 and associated circuitry.
5		Test probe to		13			Check and replace (if defective) Z1.
		Z1 pins 8, 9				+0.5 to +0.9 Vdc	
		Z1 pins 6, 7				-9.0 to -11.0 Vdc	

Table 6-29. Range Rate D/A Converter Circuit Card 2A2A6A3, Test and Troubleshooting Procedure - Continued

Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication	Corrective action if indication abnormal
			TEST POINT		Other		
			A	B			
6		Test probe to: Z3 pins 6, 7 Z3 pins 8, 9		13		-9.0 to -11.0 Vdc 0 Vdc	Check and replace (if defective) Z3.
7		Test probe to Z5 pin 6		13		-6.8 to -7.2 Vdc	Check and replace (if defective) Z5.
8		Test probe to: Z2 pin 6 Z2 pins 7, 8, 9		13		+0.5 to +0.9 Vdc -9.0 to -11.0 Vdc	Check and replace (if defective) Z2.
9		Test probe to: Z4 pin 6 Z4 pins 7, 8, 9		13		0 Vdc -9.0 to -11.0 Vdc	Check and replace (if defective) Z4.
10		Test probe to: Z6 pin 6 Z6 pin 7		13		+9.6 to +9.8 Vdc 0 Vdc	Check and replace (if defective) Z6.
11		Connect multimeter test probe to test jack A	41	13		+9.77 to +9.78 Vdc	Adjust circuit card R15 for +9.775 Vdc. Check and replace (if defective) AR3 and associated circuitry.

Table 6-29. Range Rate D/A Converter Circuit Card 2A2A6A3, Test and Troubleshooting Procedure - Continued

Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication	Corrective action if indication abnormal
			TEST POINT		Other		
			A	B			
12				13	RESET to ON TEST to 1	-9.77 to -9.78 Vdc	Adjust circuit card R16 for -9.775 Vdc. Check and replace (if defective) AR3 and associated wiring.
13		Disconnect multimeter test probe from test jack A and connect to circuit card test points: Z1 pins 6, 7 Z1 pins 8, 9		13		+0.5 to +0.9 Vdc -9.0 to -11.0 Vdc	Check and replace (if defective) Z1.
14		Test probe to: Z3 pins 6, 7 Z3 pins 8, 9		13		0 Vdc -9.0 to -11.0 Vdc	Check and replace (if defective) Z3.
15		Test probe to Z5 pin 6		13		-1.8 to -2.2 Vdc	Check and replace (if defective) Z5.
16		Test probe to: Z2 pin 6 Z2 pins 7, 8, 9		13		-9.0 to -11.0 Vdc +0.5 to +0.9 Vdc	Check and replace (if defective) Z2.
17		Test probe to: Z4 pin 6 Z4 pins 7, 8, 9		13		-9.8 to -10.2 Vdc 0 Vdc	Check and replace (if defective) Z4.

Table 6-29. Range Rate D/A Converter Circuit Card 2A2A6A3, Test and Troubleshooting Procedure - Continued

Step	Test card	Test instrument controls and connections	MX-8050 controls			Normal indication	Corrective action if indication abnormal
			TEST POINT		Other		
			A	B			
18		Test point to: Z6 pin 6 Z6 pin 7		13		-9.6 to -9.8 Vdc -4.8 to -5.2 Vdc	Check and replace (if defective) Z6.
19		Connect multimeter test probe to test jack A	41	13		-9.77 to -9.78 Vdc	Adjust circuit card R16 for -9.775 Vdc. Check and replace (if defective) AR3 and associated circuitry.
20		Connect multimeter test probe to circuit card test point Z5 pin 6		13	TEST to 2	0 Vdc	Check and replace (if defective) Z5.
21		Test probe to Z6 pins 8, 7		13		0 Vdc	Check and replace (if defective) Z6.
22		Connect multimeter test probe to test jack A	41	13		-0.03 to +0.03 Vdc	Check and replace (if defective) AR3.
23		Connect multimeter test probe to circuit card test point Z5 pin 6		13	RESET to OFF TEST to 1	-8.8 to -9.2 Vdc	Check and replace (if defective) Z5.
24		Test probe to: Z6 pin 6 Z6 pin 7		13		0 Vdc -4.8 to -5.2 Vdc	Check and replace (if defective) Z6.
25		Connect multimeter test probe to test jack A	41	13		-0.03 to +0.03 Vdc	Check and replace (if defective) AR3.

Section V. TEST AND TROUBLESHOOTING ACCESSORY EQUIPMENT

6-23. Accessory Equipment.

a. Deleted.

b. Test and troubleshooting procedures for test set assembly adapter (11748235) used when testing power series assembly A21A16 is performed using table 6-31.

c. Procedures for extender boards and test adapters, not previously mentioned, used with the AN/TSM-100 are not required. Test and troubleshooting of extender boards is obvious from the physical layout and appearance.

d. Perform tests described in table 6-31 using figure 8-11 and figure 8-12 when testing test set adapter (11748235). Use figure 8-11 when checking point to point wiring connections not covered in table 6-31.

e. Test and troubleshooting of the test unit adapter and binding post adapter CP129 is obvious from the detailed schematics, figures 8-2 and 8-13. Covers on the two servo amplifier adapter assemblies should be removed to facilitate testing and troubleshooting.

Section VI. TEST AND TROUBLESHOOTING TEST CABLE ASSEMBLIES

6-24. Test Cable Assemblies. Test and troubleshooting procedures for test cables used with the AN/TSM-100 are not required. Continuity testing of test cable assemblies W101 through W119, W126, W127, W131 through W134, W137, W138 is obvious from the detailed schematics, figure 8-35 through 8-66.

All data on pages 6-252 and 6-253, including table 6-30, deleted.

Table 6-31. Test Set Adapter TS3 (11748235) Test and Troubleshooting Procedure

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
1.	Make sure all AN/TSM-100 ON/OFF switches are set to OFF position and all circuit breakers are set in.			
2.	At power panel (2A1A3), set 115V, 400CY, 1 PHASE ON/OFF switch and DISTRIBUTION +24 VDC ON/OFF switch to ON. Set DISTRIBUTION switch to SIGHT CUR GEN. At AN/TPM-22 set 115V 400CPS switch to ON.	At power panel 115V 400CY 1 PHASE indicator and +24VDC indicator lights.	Continue test.	Perform power panel checkout, table 6-2.
3.	At battery charger (2A1A4), set AC-ON switch to ON. Make sure MODE CURRENT ADJUST control is set fully clockwise. Observe VOLTS DC meter and AMPERES DC meter.	At battery charger, AC indicator lights, ammeter indicates a charging current, voltmeter indicates a charging voltage between +27.0 to +27.5 Vdc. NOTE If operating in extreme cold temperatures, charging voltage may be set to greater than +27.5 Vdc. Refer to table 6-33 for proper upper limit for charging voltage in extreme cold temperatures.	Continue test.	If VOLTS DC meter indication is greater than upper limit, adjust battery charger MODE VOLTAGE ADJUST control to set proper upper limit voltage value. Perform power panel fault isolation procedures in table 6-3, step C. Fig. FO-5, fig. FO-3, battery charger manual (appendix A).

Table 6-31. Test Set Adapter TS3 (11748235) Test and Troubleshooting Procedure - Continued

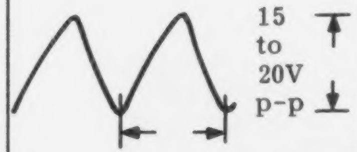
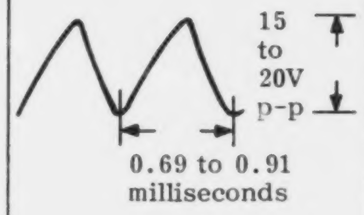
Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
4.	At SCG servo test panel, set following controls: POWER Switch to ON UUT-PS1 to ON			
5.	Connect cable assembly W209 between SCG servo test panel (J3) and power series assembly adapter box (J1).			
6.	Set multimeter MODE FILTER to IN. Connect black lead of multimeter to TP-4 (gnd). With red lead measure voltages at following test points: TP5 MODE switch RADAR MANUAL TP3	 +13.0 to +17.0 Vdc. -13.0 to -17.0 Vdc. -6.99 to -7.01 Vdc.	Continue test.	Check power supplies PS2 to PS3 in SCG servo test panel. Check Z1, Z2, Z3, and associated circuitry. Fig. 8-9 through fig. 8-12. Replace (if defective) PS2, PS3, Z1, Z2, or Z3.
7.	Connect oscilloscope CH1 to TP1	 0.89 to 1.11 milliseconds	Continue test.	Check Z3, C1, R6, R7, R8, R9, and R10. Fig. 8-10, fig. 8-12. Replace defective component.

Table 6-31. Test Set Adapter TS3 (11748235) Test and Troubleshooting Procedure - Continued

Step	Procedure	Normal indication	If indication is normal	If indication is abnormal
8.	Connect oscilloscope CH1 to TP2.	 15 to 20V p-p 0.69 to 0.91 milliseconds		Check Z2, C2, R11 R12, R13, R14, and R15. Fig. 8-10, fig. 8-12. Replace defective component.

Section VII. GENERAL MAINTENANCE

6-25. General. The AN/TSM-100 test set group is maintained by direct support (DS) maintenance level personnel. The maintenance functions of the DS level personnel are shown in the Maintenance Allocation Chart (MAC) in appendix B. The maintenance functions are to a. inspect, b. test, c. service, d. adjust, e. align, f. calibrate, g. install, h. replace, i. repair, j. overhaul, and k. rebuild the equipment. Calibration of common test equipment is performed by a separate calibration/repair facility (AN/TSM-55(V)5).

6-26. Maintenance Instructions. Table 6-32 shows a list of the various maintenance efforts required, the frequency of performance, and references to the actual procedures to be performed.

6-27. Battery Maintenance.

a. Battery maintenance consists of removal and installation, inspection, charging, cleaning, repair, and checking electrolyte level weekly. Detailed Vulcan battery maintenance instructions are contained in TM 11-6140-203-15-3, Operator, Organizational, DS/GS, and Depot Maintenance Manual, including repair parts and special tools list: Nonaircraft nickel-cadmium batteries. General AN/TSM-100 battery assembly maintenance instructions are provided in this section.

b. Normally an AN/TSM-100 battery assembly is received discharged with a shorting coil across the output connector (J2). The battery cells may either be dry or contain an unknown amount of electrolyte. The battery assemblies must be charged before being installed. Uncharged batteries must be serviced by a nickel-cadmium battery maintenance facility.

Table 6-32. Maintenance Efforts

Maintenance effort	Frequency of performance	Reference
Installation, replacement	On receipt of equipment	Chapter 6, section I
Inspect, service and adjust:		
Lubrication	Every 6 months	Chapter 2, section II
Preventive maintenance	As required	Chapter 2, section II
Battery maintenance	As required (weekly check)	Chapter 6, section VII
Preparation for shipment and storage	As required	Chapter 6, section II
Tests (checkout/fault isolation)	Every 120 days or after repair and service	Chapter 6
Repair	As required	Chapter 7

NOTE

When a battery in service becomes faulty or will not hold a charge, remove the battery and have it serviced by a nickel-cadmium battery maintenance facility.

To remove and install battery assemblies in the AN/TSM-100, perform the following procedures in the order indicated. Figure 6-5 illustrates a typical battery assembly.

WARNING

Be extremely careful when working in the vicinity of batteries when the battery case cover is open. Do not use uninsulated tools. Do not wear rings or watches. Metal articles will, if allowed to contact intercell links, cause severe arcing with possible injury to personnel and damage to the battery. The electrolyte used in the batteries is a caustic solution of potassium hydroxide. Use normal precautions to prevent the solution from coming in contact with any part of the body. If the electrolyte gets on the skin, wash the affected areas with large quantities of water and seek immediate medical attention. If electrolyte gets into the eyes, flush with water and seek immediate medical attention. The vapor from this electrolyte can be explosive. Extinguish any cigarettes or open flames in the vicinity of the batteries before removing cell caps.

c. To remove the nickel-cadmium batteries, proceed as follows:

(1) Make sure that all AN/TSM-100 ON/OFF switches are set to OFF.

(2) Remove battery assembly access panels (fig. 1-1) from AN/TSM-100.

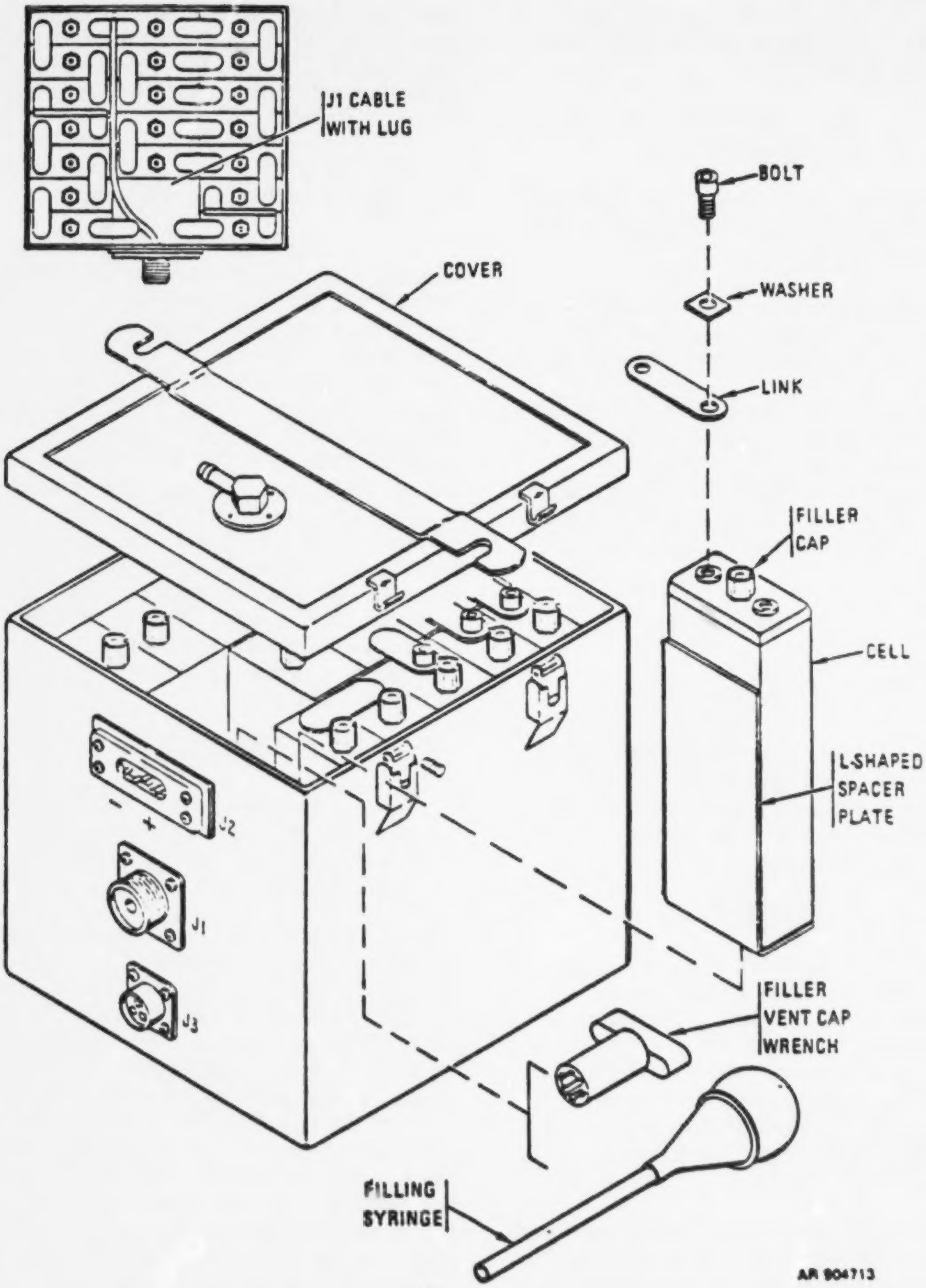

J1 CABLE WITH LUG
BOLT
COVER
WASHER
LINK
FILLER CAP
CELL
J2
J1
J3
L-SHAPED SPACER PLATE
FILLER VENT CAP WRENCH
FILLING SYRINGE
AR 904713

Figure 6-5. Typical AN/TSM-100 battery assembly.

(3) Remove W123-P118 connector from the right-hand battery assembly and W123-P113 connector from the left-hand battery assembly.

(4) Cover the battery J2 connectors with a cover or insulation tape.

(5) Remove the molded tee venting hose from the venting hose adapters on each battery assembly.

(6) Loosen the two wing nuts on the mounting tray clevis rods and unhook from the top of each battery assembly.

(7) Remove batteries from the mounting trays being careful not to damage battery connectors. Retain battery venting covers, replace on new storage battery. Forward other nickel-cadmium battery to maintenance facility for servicing.

d. To install the battery assemblies, proceed as follows:

WARNING

The vapor from electrolyte can be explosive. Extinguish any cigarettes or open flames in the vicinity of the batteries before removing the covers.

WARNING

Be extremely careful when working in the vicinity of a battery when the case cover is open. Do not use uninsulated tools. Do not wear rings, or watches. Metal articles will, if allowed to contact intercell links, cause severe arcing with possible injury to personnel and damage to the battery.

(1) After a battery has been serviced and fully charged, cover the battery J2 connector with a cover or insulating tape. Using the filling syringe, make a final check of the electrolyte level in each cell. Install all battery cell filler vent caps using the vent capwrench. Make sure that the caps are securely installed. Make sure that the filling syringe contains no electrolyte. Place the filling syringe and vent cap wrench back in the storage area in the battery.

(2) Install battery assembly cover and secure with cover latches.

(3) Install the battery assembly molded tee shaped venting hose to the AN/TSM-100. Inspect the venting hose for cracks or other damage. Refer to figure 6-6; tighten the clamp on the portion of the hose that fits through the hole in the rear of the AN/TSM-100 and mates with the exhaust vent pipe in the shelter wall. Fit the hose over the exhaust vent pipe through the hole in the rear of the AN/TSM-100. Adjust the clamp on the hose until the hose just fits snugly over the exhaust vent pipe. Remove the hose and adjust the clamp slightly to tighten. Force the hose onto the exhaust vent pipe. Make sure that the hose is securely fitted onto the exhaust vent pipe.

WARNING

Failure to perform the following step can result in a potentially dangerous buildup of battery vapor inside the shelter.

(4) Remove the battery vent tube cover outside the shelter.

(5) Refer to figure 6-6 and set the battery assemblies in their mounting trays in the AN/TSM-100. The battery assemblies are mounted with the connectors facing forward and the venting hose adapters, on the covers, facing toward the center of the AN/TSM-100. Secure the battery assemblies by setting the mounting tray clevis rods in the slots on the battery covers. Hand tighten the wing nuts on the clevis rods.

(6) Connect the molded tee venting hose to the venting hose adapters on each battery assembly cover. Refer to

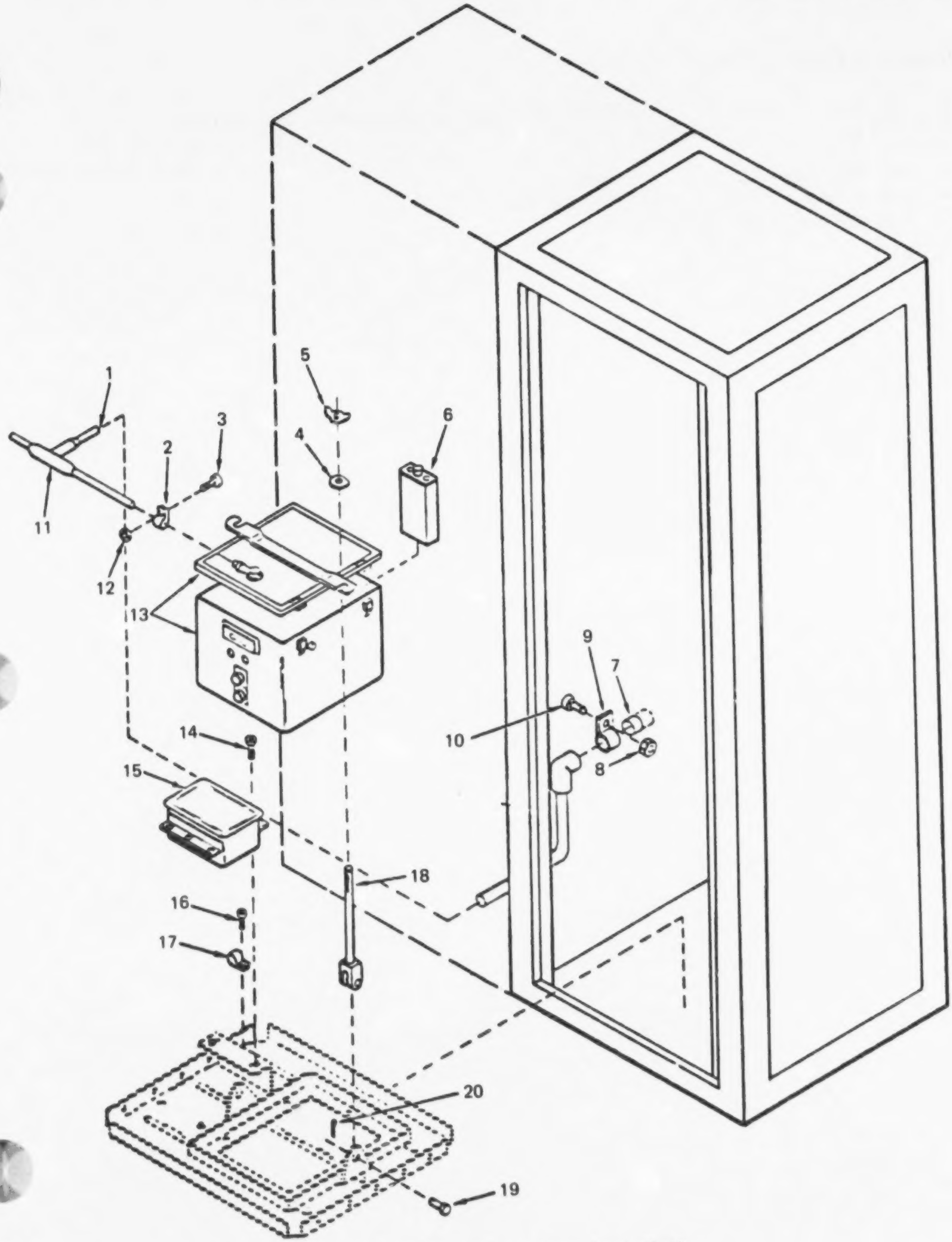

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Figure 6-6. AN/TSM-100 battery installation.

Legend for figure 6-6:

1. Tubing
2. Clamp
3. Screw
4. Washer, key
5. Nut, wing
6. Battery, storage cell
7. Battery fumes exhaust vent
8. Nut
9. Clamp
10. Screw
11. Molded tee
12. Nut
13. Battery
14. Screw
15. Dc-to-dc power supply
16. Screw
17. Clamp
18. Clevis rod

figure 6-6. Fit the hose onto each adapter. Tighten hose clamps that secure the hose to the adapters. Make sure that the hose is securely clamped to both adapters.

(7) Remove the covers or tape from the battery assembly J2 connectors. Connect the battery assemblies to the AN/TSM-100 internal cable connectors. The left-hand battery (2A1A5A1) J2 connector mates with the internal cable assembly W123-P113 connector. The right-hand battery (2A2A5A1) J2 connector mates with the W128-P118 connector.

(8) Reinstall battery assembly access panels. Make sure that the access panels are tightly secured to the AN/TSM-100 console with the spring-loaded fasteners.

(9) At the AN/TSM-100 power panel (2A1A3) set the 115V 400CY 1 PHASE, ON/OFF switch to ON. Note whether the power panel 115V 400CY 1 PHASE indicator lights. If the indicator fails to light, perform the power panel test and troubleshooting procedures in tables 6-2 and 6-3.

CAUTION

Make sure that the AN/TSM-100 internal cable assembly W123-P113 and W123-P118 connectors do not make contact with any metal object while operating the battery charger (2A1A4). If the connector conductors contact metal, severe arcing may result.

(10) At the AN/TSM-100 battery charger (2A1A4) set the MODE CURRENT ADJUST control fully counterclockwise (off position). Set the battery charger ON switch to ON. Note whether the battery charger AC indicator lights; disregard all other indications. If the indicator fails to light, refer to the battery charger manual and proceed to check out the battery charger. Adjust battery charger MODE VOLTAGE ADJUST control for +27.0 to +27.5 Vdc indication on the VOLT DC meter. The +27.0 to +27.5 Vdc setting is for operating the batteries at room temperature. After the operating voltage is set, place the AN/TSM-100 power panel (2A1A3) 115V 400CY 1 PHASE ON/OFF switch to the OFF position.

6-26. Electrolyte Inspection.

Under normal conditions the electrolyte level should be checked weekly. In dry climates the check should be made twice a week. Batteries should be fully charged and rested on an open circuit for approximately two hours before the check is made. The two-hour rest allows the potentially hazardous battery gases generated during charging to be completely vented out of the batteries. To inspect the battery assemblies in the AN/TSM-100 for proper electrolyte level, perform the following procedures in the order indicated.

a. Make sure that all ON/OFF switches on the AN/TSM-100 are set to OFF.

b. At the AN/TSM-100 power panel (2A1A3) set the 115V 400CY 1 PHASE ON/OFF switch to ON. Note whether the power panel 115V 400CY1 PHASE indicator lights. If the indicator fails to light, perform the power panel test and troubleshooting procedures in tables 6-2 and 6-3.

c. At the AN/TSM-100 battery charger (2A1A4), set the AC-ON switch to ON. Note whether the battery charger AC indicator lights. If the indicator fails to light, refer to the battery charger manual and check out the battery charger. Monitor the battery charger VOLTS DC meter and AMPERES DC meter. Check that the VOLTS DC meter indication does not exceed +27.0 to +27.5 Vdc (refer to table 6-33 for proper voltage indication if charging under extreme temperature conditions). The AMPERES DC meter should indicate a charging current. When the AMPERES DC meter indication decreases to 5 amperes or less, the batteries can be considered charged, and the procedures continued.

NOTE

Do not proceed until the indication is 5 amperes or less as erroneous indications can result during operation.

NOTE

Table 6-33 is used for charging of battery only. Do not use as reference for normal operation.

d. Remove the charging voltage by setting the battery charger AC-ON switch to OFF. Set the AN/TSM-100 power panel 115V 400CY 1 PHASE ON/OFF switch to OFF.

e. Remove the battery assembly access panels. Disconnect the internal cable connectors from the batteries. Cover or tape the battery connectors. Leave the battery assemblies in the AN/TSM-100 connected to the venting hose for two hours.

f. After the battery assemblies have rested in the AN/TSM-100 for approximately two hours, release the clevis rods holding the battery assemblies by loosening the wing nuts on the rods. Slide the batteries out of the AN/TSM-100. Remove the battery assembly covers (four latches on each).

g. Visually inspect the batteries, covers and vent hoses for damage. Check for cracks, breaks, dents, swelling, corrosion, burns, discoloration, spewed or spilled electrolyte, and loose connections. Refer to paragraph 6-35 for procedures to clean the batteries if necessary.

WARNING

The electrolyte used in the batteries is a caustic solution of potassium hydroxide. Use normal precautions to prevent the solution from coming in contact with any part of the body. If electrolyte gets on the skin, wash the affected areas with large quantities of water and seek immediate medical attention. If electrolyte gets into the eyes, flush with water and seek immediate medical attention.

h. Using the special insulated vent cap wrench stored inside the battery, remove the filler vent caps on all the cells in both batteries. Caps are removed by making a one-quarter turn and then pulling the cap straight out.

CAUTION

Do not use containers, syringes, or tools that have been used for servicing lead-acid batteries. Do not use distilled water from containers labeled "water for batteries" since this water may have been shipped in containers used for shipping sulphuric acid. Just a

Table 6-33. Battery Charger (2A1A4) Charging Voltage Settings versus Ambient Temperature

Temperature (°F)	Setting (Vdc)
110 or above	+25.8
100	+26.0
90	+26.8
80	+27.0
70	+27.2
60	+27.8
50	+28.2
40 or below	+28.5

trace of sulphuric acid entering a nickel-cadmium battery will cause irreversible damage. Do not spill water or electrolyte inside the battery case as corrosion may cause battery failure.

i. Using the filling syringe, also stored inside the battery, check the electrolyte level in each cell. Attempt to remove the electrolyte. If none can be removed, add a small amount of distilled water and repeat the procedure. The syringe will automatically establish the correct electrolyte level by admitting air when the level drops below the hole in the stem. Continue this procedure until all cells have the correct amount of electrolyte.

j. Reinstall all battery cell filler vent caps using the vent cap wrench. Make sure that the caps are securely installed. Make sure that the filling syringe contains no electrolyte. Place the filling syringe and vent cap wrench back in the storage area in the battery.

k. Set the batteries in their mounting trays in the AN/TSM-100. Batteries are mounted with the connectors facing forward. Install battery covers and secure cover latches. Secure battery assemblies by setting the mounting tray clevis rods in slots on the battery covers and hand tighten the wing nuts on the rods.

l. Remove covers or tape from the battery assembly J2 connectors. Connect battery assemblies to the AN/TSM-100 internal cable connectors. The left-hand battery (2A1A5A1) J2 connector mates with the internal cable assembly W123-P113 connector. The right-hand battery (2A2A5A1) J2 connector mates with the W123-P118 connector.

m. Reinstall battery assembly access panels.

6-29. Cleaning Battery Assemblies.

a. General. The battery assemblies are to be inspected for contamination or damage on receipt of materiel, during periodic electrolyte level checks, during preparation for shipment or storage, or when AN/TSM-100 checkout/fault isolation procedures isolate a malfunction to the batteries. Normally, the battery assemblies will require only external cleaning of the cases and cleaning of the cell tops. However, following spillage of electrolyte into the case, or if a battery contains excessive contamination, a more thorough cleaning is required. Instructions for performing both types of cleaning are provided in the following paragraphs.

WARNING

The vapor from electrolyte can be explosive. Extinguish any cigarettes or open flames in the vicinity of the battery before performing the procedures.

WARNING

Be extremely careful when working in the vicinity of a battery when the battery case cover is open. Do not use uninsulated tools. Do not wear rings or watches. Metal articles will, if allowed to contact intercell links, cause severe arcing with possible injury to personnel and damage to the battery.

NOTE

The battery assemblies must be removed from the AN/TSM-100 shelter before cleaning.

b. Normal Cleaning.

(1) Make sure the battery connectors are covered or taped.

(2) Inspect the battery and cover for damage.

(3) Using the special insulated vent cap wrench stored inside the battery, make sure that all cell filler vent caps are tight.

CAUTION

Do not use a wire brush. Using a wire brush will cause short-circuiting and damage to cell cases, filler vent caps, or battery terminal links.

(4) Remove white powdery deposits of potassium carbonate from battery links, cell tops, and inside the battery case cover, using a dry, clean cloth (item 2, Appendix D) or plastic brush.

(5) Clean the outside of the battery case with a detergent (item 3, Appendix D

(6) Reinstall battery assemblies in the AN/TSM-115 shelter.

c. Cleaning After Electrolyte Spillage. If electrolyte spillage occurs, remove battery assembly and forward to a nickel-cadmium battery maintenance facility for servicing.

6-30. Repairing Battery Assemblies. Remove damaged batteries and forward to a nickel-cadmium battery maintenance facility. Nickel-cadmium batteries will be repaired in accordance with TM 11-6140-203-15-3.

Section VIII. REMOVAL AND INSTALLATION OF MAJOR COMPONENTS AND ASSEMBLIES

6-31. Removal of Major Components.

a. Drawer-Mounted Assemblies. Drawer-mounted panel assemblies (2A1A1, 2A1A2, 2A1A3, 2A2A2, 2A2A6) are removed and replaced as follows (figs. 6-7 and 6-8):

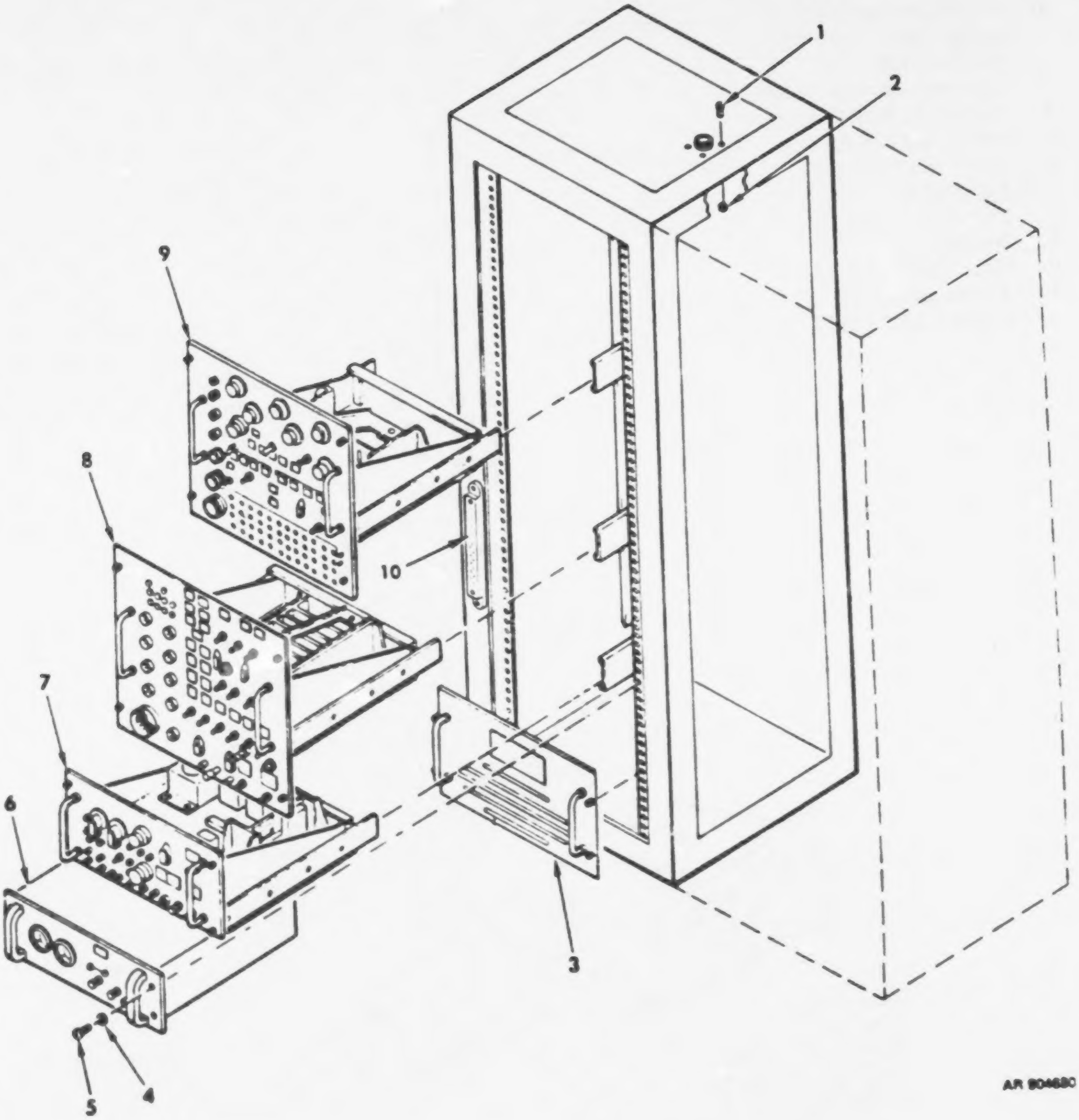
CAUTION

Make sure that all power is off.

(1) Loosen the four captive screws on the front panel of the assembly.

(2) Slowly pull assembly outward until mechanical stops on the drawer slide assemblies click and prevent further withdrawal.

(3) Disconnect all cables between the console and the assembly to be removed.



1. Screw
2. Nut
3. Vented access panel (2A1A5)
4. Washer, flat
5. Screw
6. Battery charger (2A1A4)
7. Power panel (2A1A3)
8. Distribution box panel (2A1A2)
9. Sight current generator panel (2A1A1)
10. Pin straightener

Figure 6-7. AN/TSM-100 major components, left-hand rack (2A1).

1. Control panel (2A2A1)
2. Inverter/converter motor and bracket assemblies
3. Vented access panel
4. Inverter/converter panel (2A2A4)
5. SCG servo panel (2A2A6)
6. Screw
7. Washer, flat
8. Counter (2A2A3)
9. Servo amplifier panel (2A2A2)

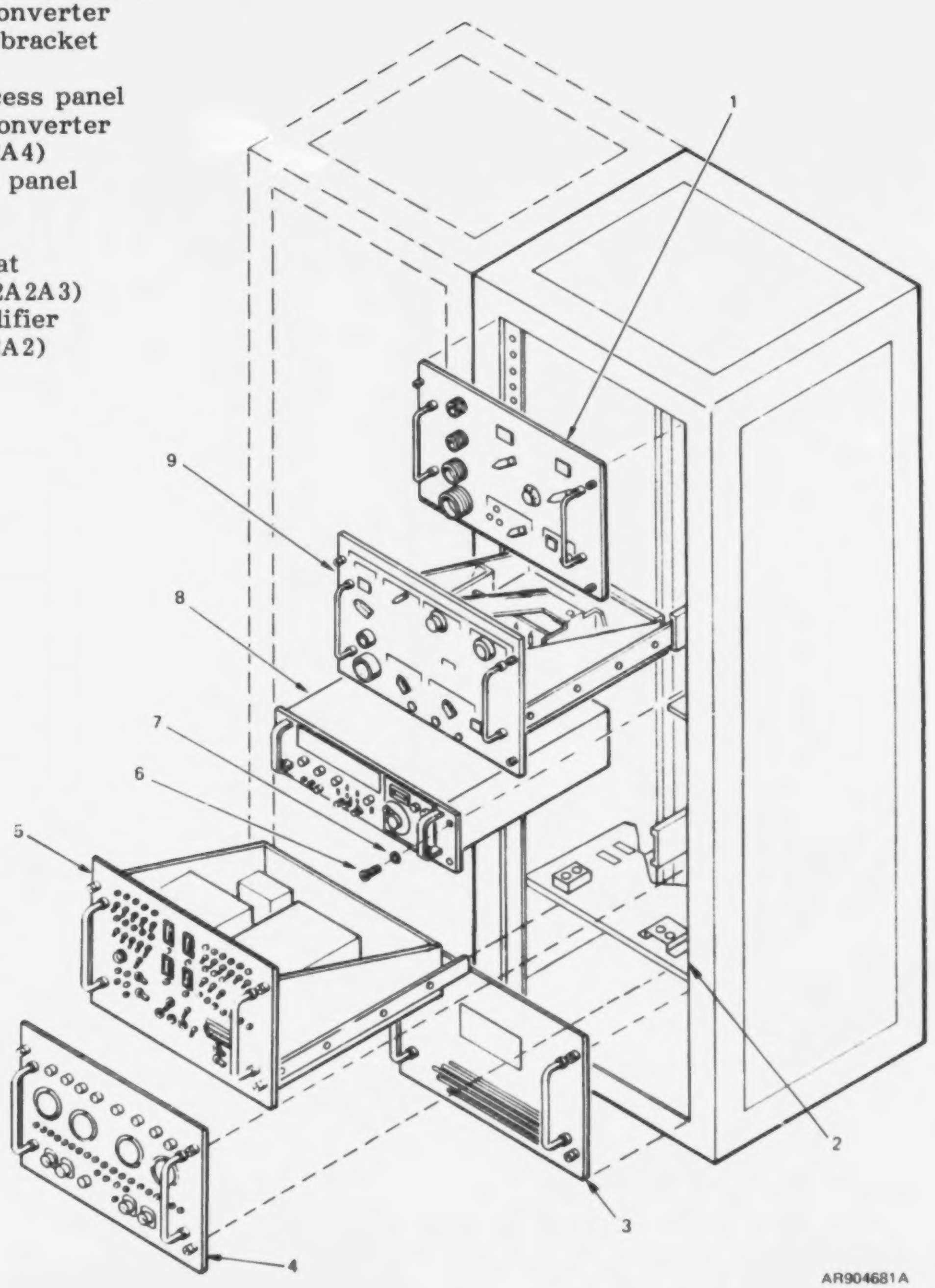


Figure 6-8. AN/TSM-100 major components, right-hand rack (2A2) (sheet 1 of 3).

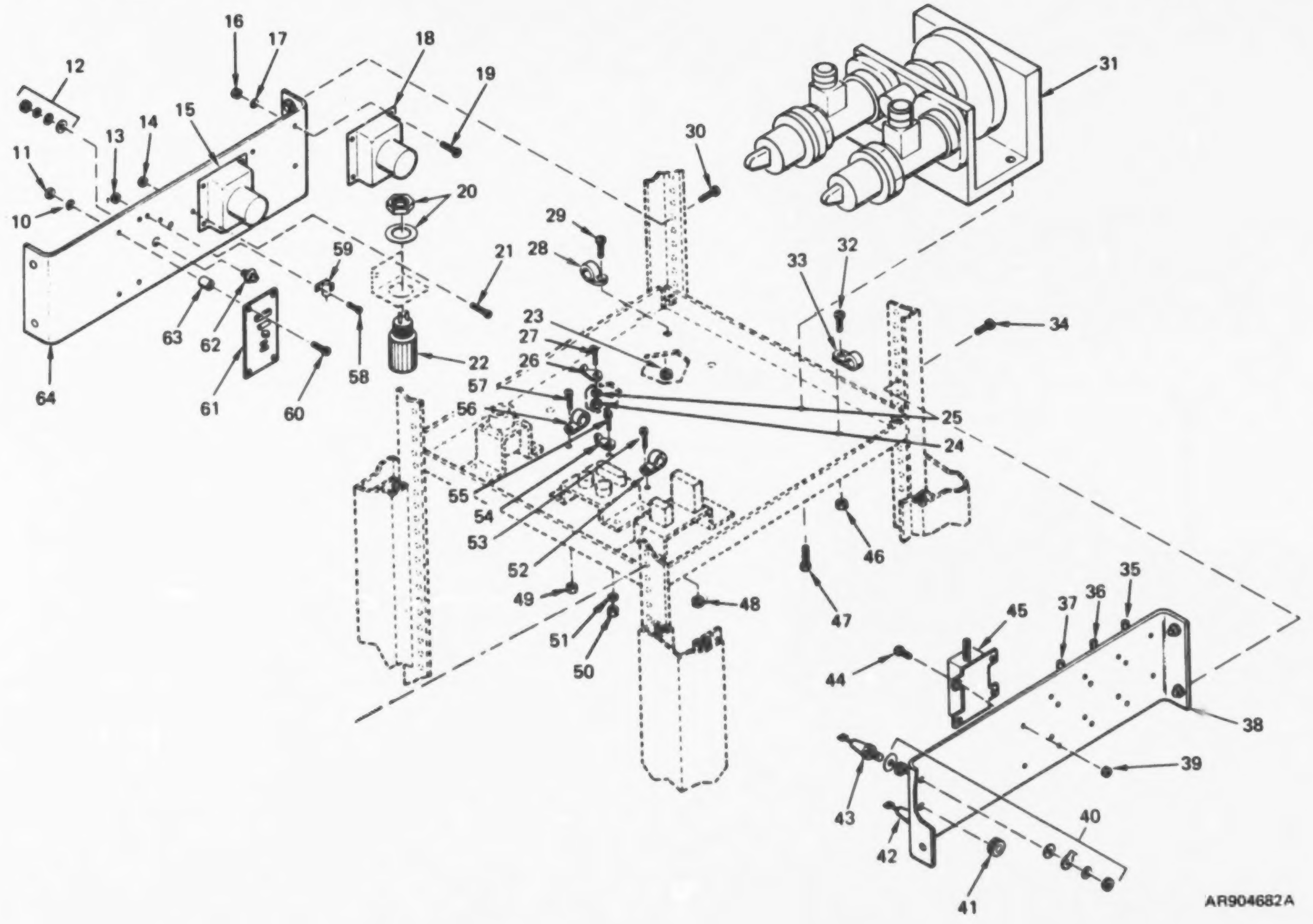

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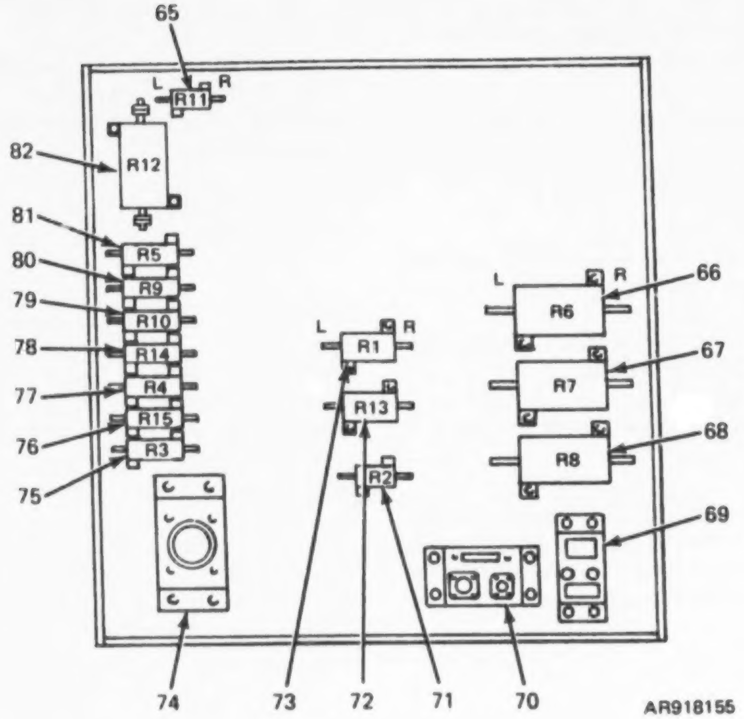
Figure 6-8. AN/TSM-100 major components, right-hand rack (2A2) (sheet 2 of 3).

Legend for figure 6- 8 (sheet 2 of 3):

10. Washer
11. Nut
12. Installation kit
13. Nut
14. Nut
15. Relay (K1)
16. Nut
17. Washer
18. Relay (K2)
19. Screw
20. Installation kit
21. Screw
22. Resistor (R10)
23. Nut
24. Nut
25. Washer
26. Lug
27. Screw
28. Clamp
29. Screw
30. Screw
31. Motor load assembly
32. Screw
33. Clamp
34. Screw
35. Resistor (R4)
36. Resistor (R3)
37. Resistor (R2)
38. Bracket
39. Nut
40. Installation kit
41. Grommet
42. Diode (CR1)
43. Diode (CR2)
44. Screw
45. Resistor (R1)
46. Nut
47. Screw
48. Nut
49. Nut
50. Nut
51. Washer
52. Clamp
53. Screw
54. Lug
55. Screw
56. Clamp
57. Screw
58. Screw
59. Resistor (R9)
60. Screw
61. Component assembly (see fig 7-15)
62. Transistor (Q2)
63. Spacer
64. Component mounting bracket assembly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R11
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R12
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R5
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R9
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R10
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R14
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R4
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R15
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R3
L
R
R1
R13
R2
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R
R6
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R7
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R8
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65. Resistor (R11)
66. Resistor (R6)
67. Resistor (R7)
68. Resistor (R8)
69. Bracket
70. Bracket
71. Resistor (R2)
72. Resistor (R13)
73. Resistor (R1)
74. Bracket
75. Resistor (R3)
76. Resistor (R15)
77. Resistor (R4)
78. Resistor (R14)
79. Resistor (R10)
80. Resistor (R9)
81. Resistor (R5)
82. Resistor (R12)

Figure 6-8. AN/TSM-100 major components, right-hand rack (2A2) (sheet 3 of 3).

CAUTION

Four assemblies (battery charger 2A1A4, control panel assembly 2A2A1, counter 2A2A3, and inverter/converter panel 2A2A4) do not have slides or mechanical stops, and must not be mistaken for drawer-mounted assemblies as they will fall if not supported when withdrawn from the console.

(4) While supporting the drawer assembly, depress the drawer slide stops and withdraw the assembly completely from the console.

(5) To repace drawer-mounted assemblies, reverse the removal procedure.

b. Panel-Mounted Assembly. Removal and replacement of the front panel-mounted assemblies 2A2A1 and 2A2A4 is safely accomplished by two men in the following manner:

(1) While supporting the panel, loosen the four captive screws on the front panel, taking care not to permit the panel assembly to fall away from the console.

(2) Lift the panel assembly straight out from the console very carefully so as not to damage the components mounted on the rear of the panel.

CAUTION

Do not drop cable connectors onto the equipment below.

(3) Support the panel while an assistant reaches into the console to disconnect all cables between the panel and the console.

(4) Replace the panel-mounted assembly by reversing the removal procedure.

c. Shelf-Mounted Components. Shelf-mounted components consist of a battery charger assembly 2A1A4 (fig. 6-7), a counter assembly 2A2A3 (fig. 6-8), a motor assembly, and two bracket assemblies (fig. 6-8), a battery and ±15 Vdc power supply (fig. 6-9), and a battery and power inverter assembly (fig. 6-10).

d. Console Components. Console components consist of extension drawer slides and bracket (figs. 6-9 and 6-10) and cable assemblies (fig. 6-11).

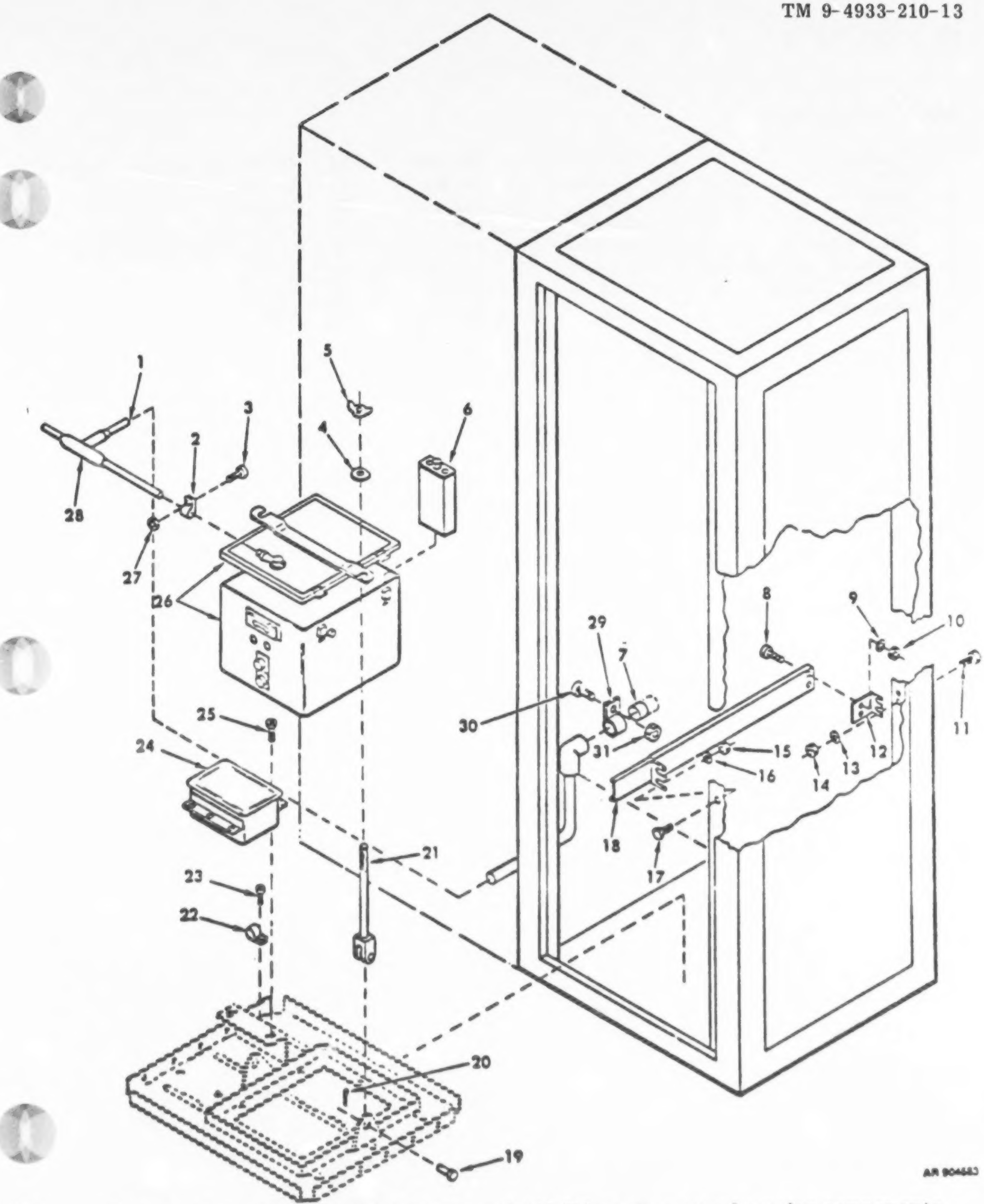
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Figure 6-9. AN/TSM-100 battery and ±15 Vdc power supply major components right-hand rack (2A2).

Legend for figure 6- 9:

1. Tubing
2. Clamp
3. Screw
4. Washer, key
5. Nut, wing
6. Battery, storage cell
7. Battery fumes exhaust vent
8. Screw
9. Washer
10. Nut
11. Screw
12. Bracket
13. Washer
14. Nut
15. Nut
16. Washer
17. Screw
18. Slide
19. Pin
20. Pin
21. Clevis rod
22. Clamp
23. Screw
24. Dc-to-dc power supply
25. Screw
26. Battery
27. Nut
28. Molded tee connection
29. Clamp
30. Screw
31. Nut

1. Nut
2. Washer
3. Bracket
4. Washer
5. Nut
6. Screw
7. Screw
8. Power inverter
9. Drawer slide
10. Screw

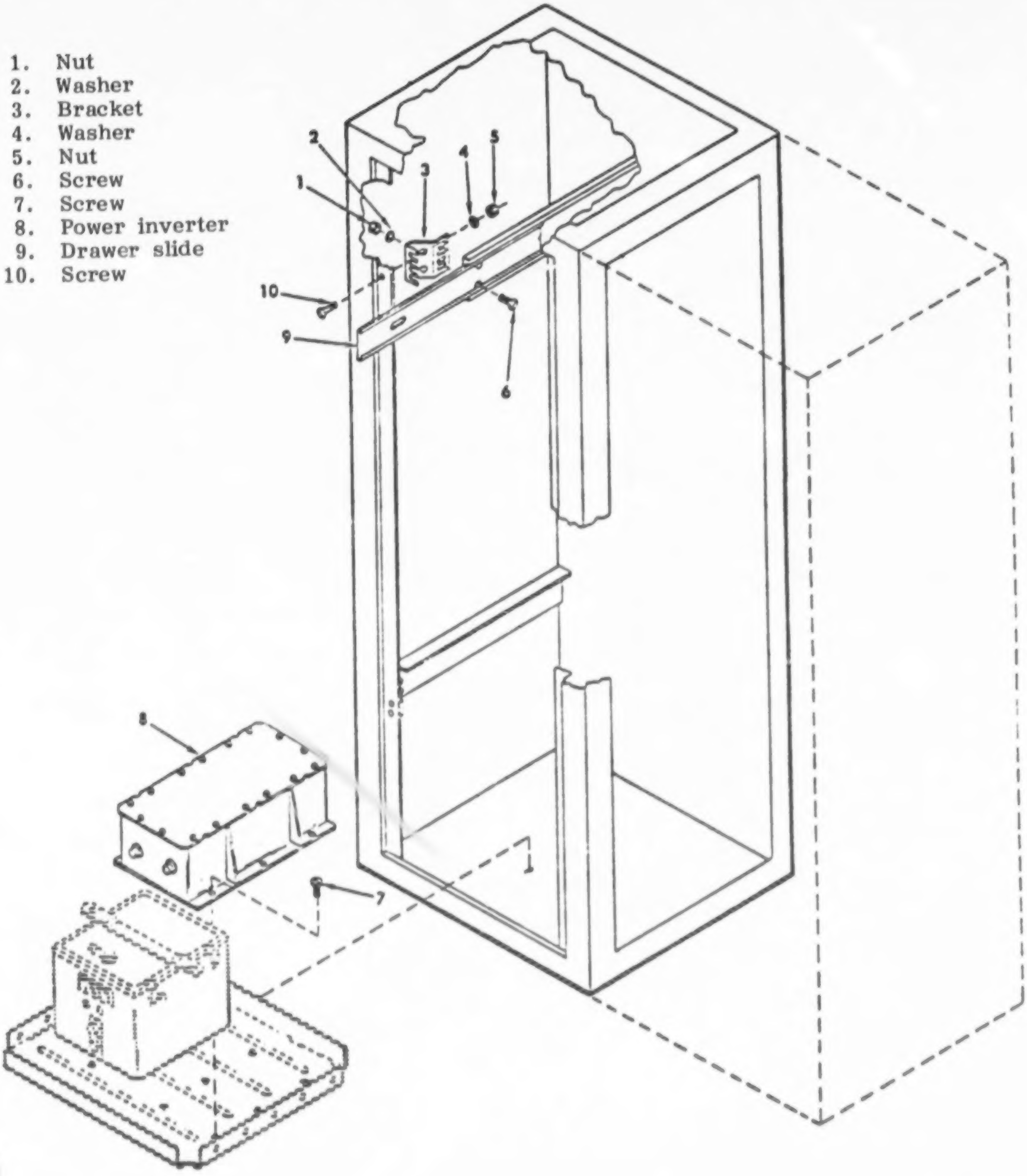
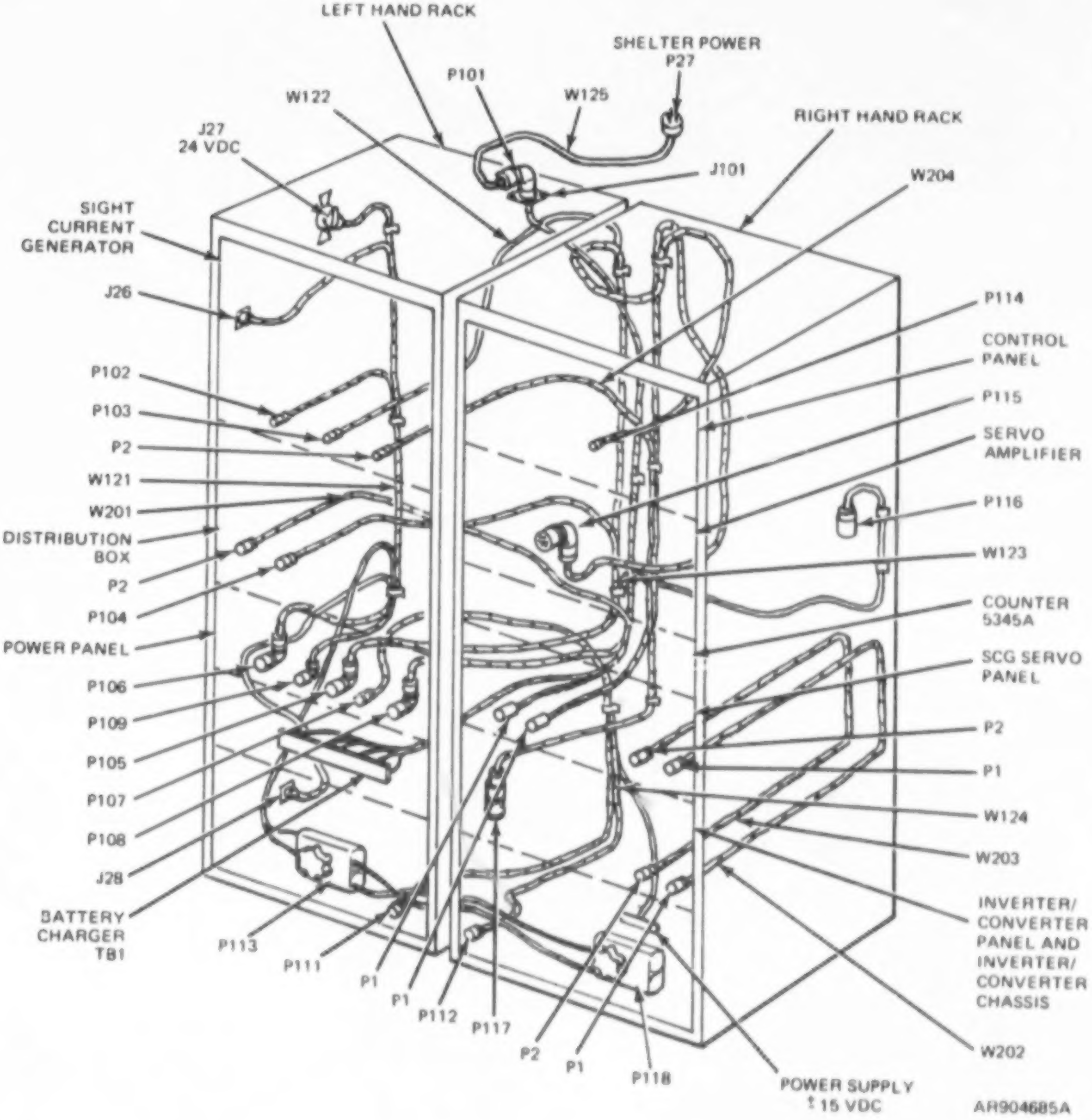


Figure 6-10. AN/TSM-100 battery and inverter major components, left-hand rack (2A1).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P101
W122
W125
SHELTER POWER
P27
J27
24 VDC
RIGHT HAND RACK
J101
W204
SIGHT
CURRENT
GENERATOR
J26
P102
P103
P2
W121
W201
DISTRIBUTION
BOX
P2
P104
POWER PANEL
P106
P109
P105
P107
P108
J28
BATTERY
CHARGER
TB1
P113
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P1
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COUNTER
5345A
SCG SERVO
PANEL
P2
P1
W124
W203
INVERTER/
CONVERTER
PANEL AND
INVERTER/
CONVERTER
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W202

Figure 6-11. AN/TSM-100 internal cable assemblies.

CHAPTER 7

REPAIR INSTRUCTIONS

Section I. GENERAL

7-1. Responsibilities. Repair at the direct support (DS) level consists of replacing damaged or malfunctioning components found during inspection and test and troubleshooting procedures. Removal of major assemblies, subassemblies, or components is performed only to the extent necessary to accomplish the required repairs. Refer to the Maintenance Allocation Chart (MAC) in appendix B to determine the level of responsibility for maintenance functions. Items not identified in the MAC, such as accessory equipment, may be repaired by direct support maintenance personnel, if authorized by pertinent directives.

7-2. Depot Repaired Components. The DC to DC ±15 volt power supply, power static inverter, battery charger, and counter are repaired at the depot maintenance level.

Section II. REPAIR OF AN/TSM-100

7-3. General. This section contains instructions for removal and replacement of assemblies, subassemblies, and parts that need repair. If the procedure for removal and replacement of an item is obvious, instructions will not be given. Nor will instructions be given for removal and replacement of items which have no repair parts maintenance allowance, unless such items must be removed for repair and replacement of another item. Repair procedures for the battery charger (2A1A4) and counter (2A2A3) are contained in the battery charger and counter manuals (appendix A) furnished with the equipment.

7-4. Common Repair and Replacement Instructions.

a. Soldered Connections. Switches, lamp assemblies, and components with soldered connections must be removed and replaced with care so that wires are reconnected properly, that excess heat does not damage insulation and components, and that excess solder does not splash on the equipment.

b. Indicator Lamps. Removal and replacement of front panel indicator lamps is accomplished as follows:

(1) Grasp edges of indicator lens with fingernails and gently pull outward until lens seats against stop.

(2) Rotate lens 90° either cw or ccw, then withdraw lens further to remove.

NOTE

If lens does not feel free for withdrawal after 90° rotation, depress lens gently first, then withdraw.

(3) When lens assembly has been withdrawn, the indicator lamps can be pushed toward the rear and removed from the individual sockets.

(4) To install the lens, insert it back into the panel almost all of the way, then rotate it 90°.

c. Indicator Display Screen (Lettering). The display screen for each indicator assembly is removed as follows:

(1) Perform preceding step b(1).

(2) Slowly slide lens left or right, holding one hand under lens to catch screen if it falls.

d. Lettering and Equipment Marking. Lettering or equipment markings that are accidentally removed or damaged beyond legibility must be re-marked.

7-5. Repair of Sight Current Generator Panel (2A1A1).

a. Overall Assembly. Refer to paragraph 6-37 for removal and replacement of the overall assembly. Refer to paragraph 7-4 for removal and replacement of soldered connections, indicator lamps, and indicator screen (lettered) inserts. Refer to paragraph 7-15 of this chapter for repair of circuit card assemblies. Refer to figures 7-1 and 7-2 as an aid in disassembly of the panels, except for potentiometers R1, R2, R3, R4, and R5 (see b following).

b. Potentiometers. Potentiometers R1 through R5 must be physically aligned after replacement so that the control knob on the front panel registers properly with the front panel markings. Loosen the three mounting screws on the back panel before rotating the potentiometer body. The alignment can be accomplished by the following procedure:

(1) R2 Alignment (MANUAL RANGE/METERS).

(a) Connect the potentiometer properly (for schematic, see fig. FO-6, sheet 1). On power panel set DISTRIBUTION rotary switch to AN/MWM-2.

(b) Using cables W16 and W286 connect the power panel 15 VDC + test point to terminal number 1 on the back of MANUAL RANGE/METERS potentiometer R2, and connect 15 VDC GRD test point to terminal number 1 on the back of MANUAL RANGE RATE/KNOTS potentiometer R4.

(c) Place the MANUAL RANGE/METERS potentiometer control knob to the 500 position. On power panel set DISTRIBUTION +24 Vdc, 115V 400CY 1 PHASE, and battery charger AC-ON switches to ON.

(d) Monitor the voltage (dc) between TEST POINTS 9 (+) and 88.

(e) Rotate the potentiometer body (from the rear of the panel) until a voltage reading of 2.4 to 2.6 Vdc is obtained.

(f) Tighten the three potentiometer mounting screws on the back of the panel.

(2) R4 Alignment (MANUAL RANGE RATE/KNOTS).

(a) Connect the potentiometer properly (for schematic, see fig. FO-6, sheet 1). On power panel set DISTRIBUTION rotary switch to AN/MWM-2.

(b) Connect the power panel 15 VDC (+) test point to terminal number 1 on the back of the MANUAL RANGE/METERS potentiometer (R2), and connect the 15 VDC GRD test point to terminal number 1 on the back of MANUAL RANGE RATE/KNOTS potentiometer (R4).

(c) Place the MANUAL RANGE RATE/KNOTS potentiometer control knob in the 0 position. On power panel set DISTRIBUTION +24 VDC, 115V 400CY 1

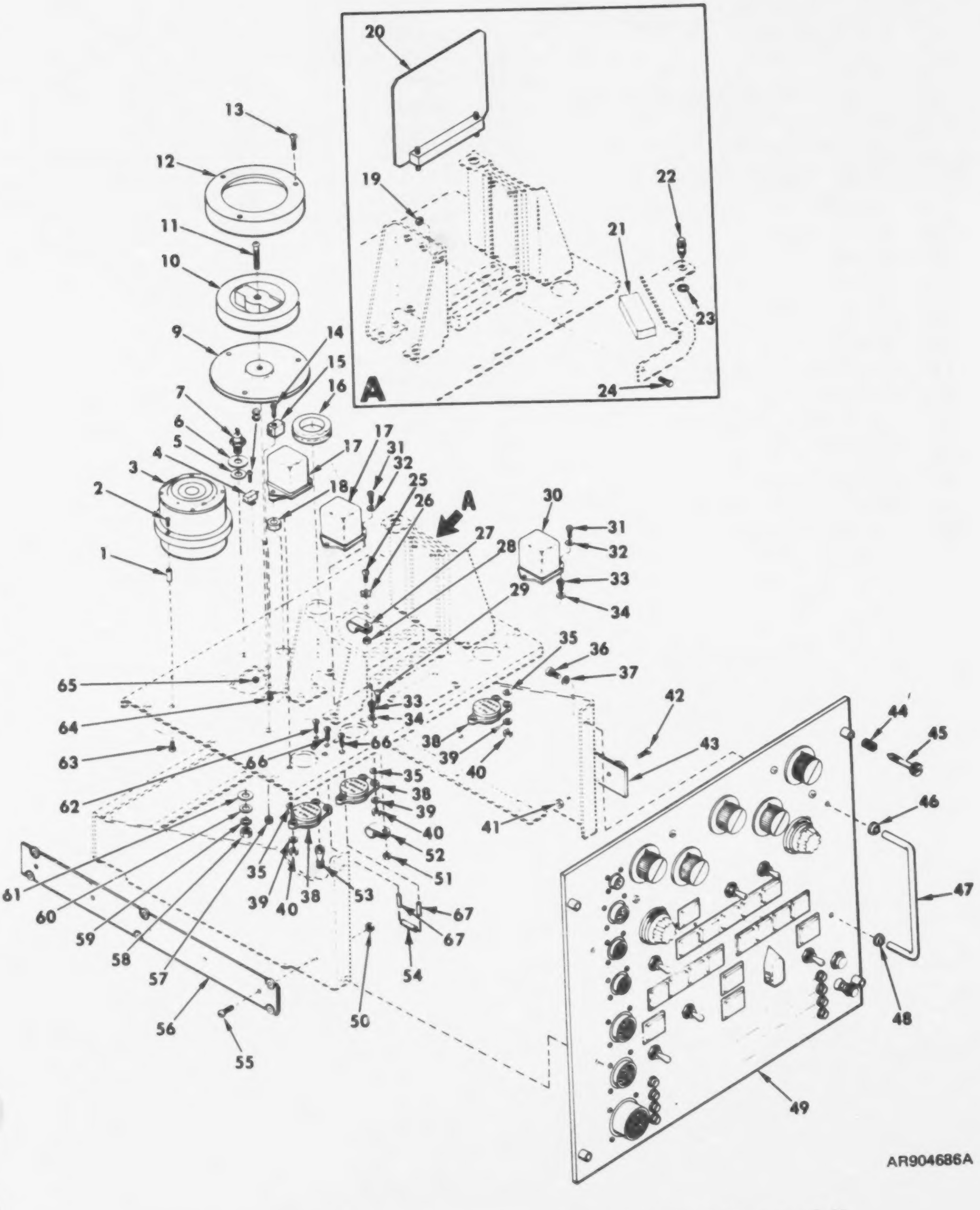
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Figure 7-1. Sight current generator panel 2A1A1 (sheet 1 of 2).

Legend for figure 7-1 (sheet 1 of 2):

1. Post
2. Screw
3. Electromagnet (see fig. 7-7)
4. Resistor (R11)
5. Teflon washer
6. Mica washer
7. Diode (CR4)
8. Screw
9. Motor base
10. Motor
11. Screw
12. Motor cover
13. Screw
14. Screw
15. Connector receptacle
16. Grommet
17. Relay (K1, K3)
18. Grommet
19. Nut
20. Circuit card
21. Pad
22. Turnlock stud
23. Push on nut
24. Screw
25. Screw
26. Washer
27. Clamp
28. Nut
29. Screw
30. Relay (K2)
31. Screw
32. Washer
33. Screw
34. Washer
35. Washer
36. Screw
37. Washer
38. Socket
39. Washer
40. Nut
41. Nut
42. Screw
43. Slide
44. Spring
45. Screw
46. Ferrule
47. Handle
48. Ferrule
49. Panel assembly
50. Nut
51. Nut
52. Clamp
53. Terminal (E1)
54. Diode
55. Screw
56. Slide
57. Nut
58. Nut
59. Washer
60. Washer
61. Mica washer
62. Screw
63. Screw
64. Nut
65. Nut
66. Screw
67. Terminal

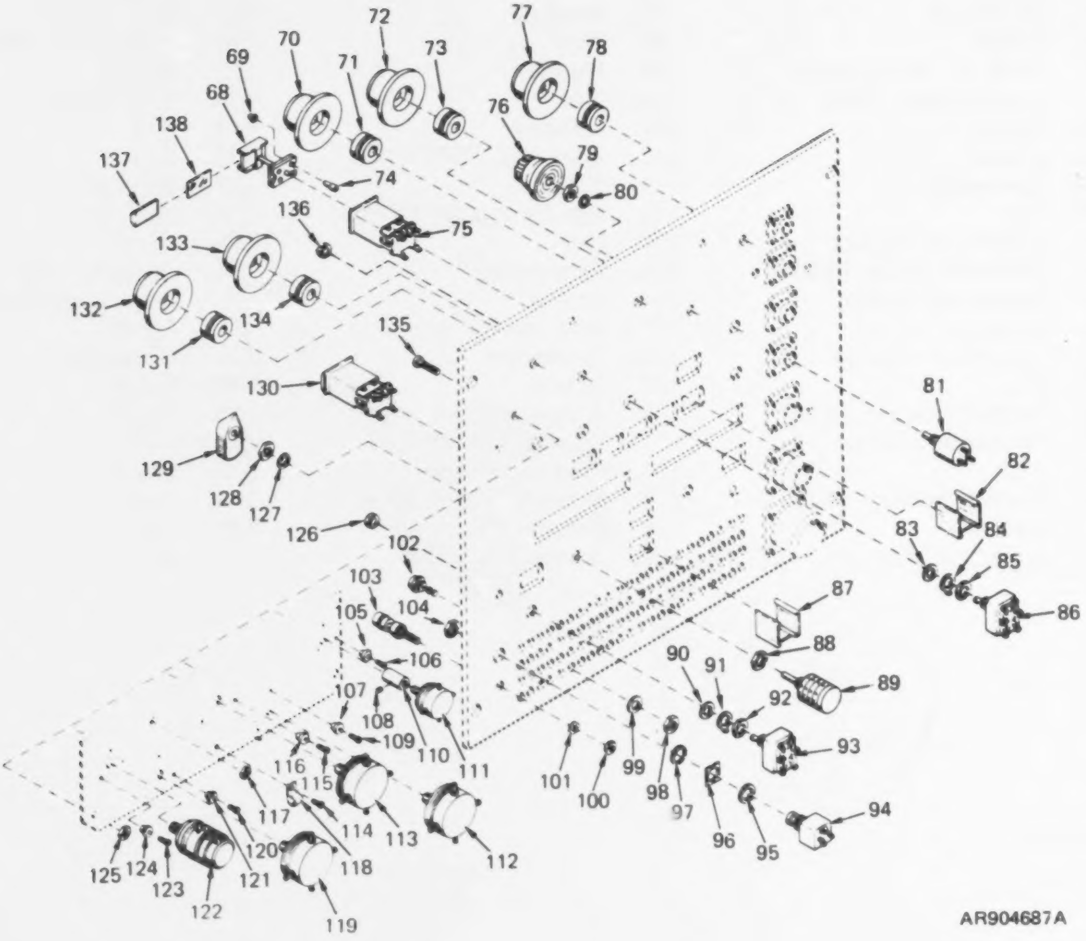
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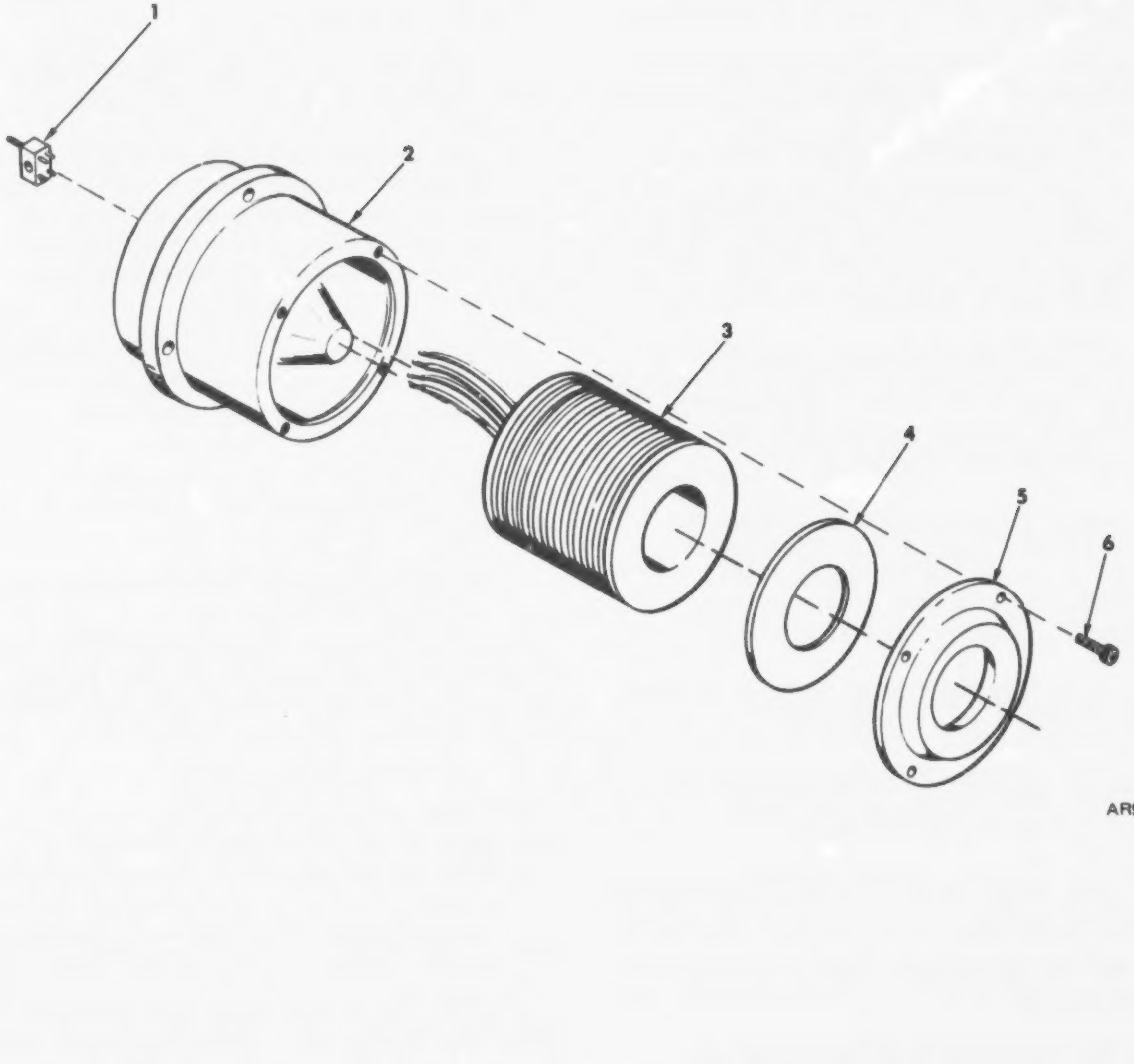
Figure 7-1. Sight current generator panel 2A1A1 (sheet 2 of 2).

Legend for figure 7-1 (sheet 2 of 2):

68. Lamp and lens assembly
69. Cap
70. Knob
71. Grommet
72. Knob
73. Grommet
74. Lamp
75. Switch, momentary pushbutton (S4)
76. Knob
77. Knob
78. Grommet
79. Nut
80. Locating washer
81. Potentiometer (R6)
82. Fastener clamp
83. Washer
84. Locating washer
85. Nut
86. Switch toggle (S15)
87. Fastener clamp
88. Nut
89. Switch rotary (S11)
90. Washer
91. Locating washer
92. Nut
93. Switch, toggle (S12)
94. Circuit breaker (CB1)
95. Washer
96. Washer
97. Washer
98. Nut
99. Washer
100. Nut
101. Washer
102. Jack tip (TP1 thru TP92)
103. Binding post (TP93)
104. Nut
105. Rim clamp
106. Screw
107. Rim clamp
108. Setscrew
109. Screw
110. Adapter
111. Potentiometer (R1)
112. Potentiometer (R2)
113. Potentiometer (R3)
114. Screw
115. Screw
116. Rim clamp
117. Nut
118. Clamp
119. Potentiometer (R4)
120. Screw
121. Rim clamp
122. Potentiometer (R5)
123. Screw
124. Rim clamp
125. Nut
126. Nut
127. Washer
128. Nut
129. Knob
130. Switch, momentary pushbutton (S10)
131. Grommet
132. Knob
133. Knob
134. Grommet
135. Screw
136. Nut
137. Lens
138. Screen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1. Connector, electrical
2. Housing
3. Coil, electromagnetic
4. Washer
5. Cover
6. Screw

Figure 7-2. Electromagnet assembly.

PHASE and battery charger AC-ON switches to ON.

(d) Monitor the dc voltage between TEST POINTS 10 (+) and 88.

(e) Rotate the potentiometer body (from the rear of the panel) until a voltage of 7.4 to 7.6 Vdc is obtained.

(f) Tighten the three potentiometer mounting screws on the back of the panel.

(3) R3 Alignment (COSINE).

(a) Connect the potentiometer properly (for schematic, see fig. FO-6, sheet 3). On power panel set DISTRIBUTION rotary switch to AN/MWM-2.

(b) Connect the power panel 15 VDC + test terminal to terminal number 4 on the back of COSINE potentiometer (R3), and connect the 15 VDC GRD test point to terminal number 1.

(c) Place the COSINE potentiometer control knob in the 60 position. On power panel set DISTRIBUTION +24 VDC, 115V 400CY 1 PHASE and battery charger AC-ON switches to ON.

(d) Monitor the dc voltage between TEST POINTS 16 (+) and 88.

(e) Rotate the potentiometer body (from the rear of the panel) until a voltage of 7.4 to 7.6 is obtained.

(f) Tighten the three potentiometer mounting screws on the back of the panel.

(4) R1 Alignment (LEAD ANGLE TRAVERSE).

(a) Connect the potentiometer properly (for schematic, see fig. FO-6, sheet 3). On power panel set DISTRIBUTION rotary switch to AN/MWM-2.

(b) Connect the power panel 15 VDC - test point to R1 Terminal 1 and Terminal 3, and connect R1 Terminal 2 to 15 VDC GRD.

(c) Using the internal 50K ohms resistance between TEST POINTS 12 and 13, connect TEST POINTS 12 to 20, and 13 to R1 Terminal 2.

(d) Monitor the voltage between SCG TEST POINTS 20 and GROUND.

(e) Place the LEAD ANGLE TRAVERSE potentiometer control knob in the 0 position. On power panel set DISTRIBUTION +24 VDC, 115V 400CY 1 PHASE and battery charger AC-ON switches to ON.

(f) Rotate the potentiometer body (from the rear of the panel) until a voltage of 0.0 to -0.12 Vdc is obtained.

(g) Tighten the three potentiometer mounting screws on the back of the panel.

(5) R5 Alignment (LEAD ANGLE EL).

(a) Connect the potentiometer properly (for schematic, see fig. FO-6, sheet 3). On power panel set DISTRIBUTION rotary switch to AN/MWM-2.

(b) Connect the power panel 15 VDC + test point to R5 cup 2 (middle pot) pins 1 and 3. Connect 15 VDC - test point to R5 cup 2 pin 2.

(c) Monitor the voltage between SCG TEST POINTS 19 and GROUND.

(d) On power panel set DISTRIBUTION +24 VDC, 115V 400CY 1 PHASE and battery charger AC-ON switches to ON.

(e) Rotate LEAD ANGLE EL control to +15°; then to -15°. Multimeter should indicate +5.3 to +5.5 Vdc at either 15° location. If not, rotate the potentiometer body (from the rear of the panel to obtain proper indication).

(f) Leave the LEAD ANGLE EL control set to a +15° angle with the multimeter indicating +5.3 to +5.5 Vdc.

(g) Remove the 15 VDC test point connected to R5 cup 2 pins 1 and 3, and reconnect to R5 cup 1 pins 1 and 3. The voltage at SCG TEST POINTS 18 should be +8.8 to +9.2 Vdc. If not, replace R5.

(h) Remove the 15 VDC test point connected to R5 cup 1 pins 1 and 3, and reconnect to R5 cup 3 pins 1 and 3. Multimeter should read +3.04 to +3.44 Vdc at SCG TEST POINTS 17. If not, replace R5.

(i) Tighten the three potentiometer mounting screws on the back of the panel.

7-6. Repair of DISTRIBUTION BOX panel (2A1A2). Refer to paragraph 6-31 for removal and replacement of the overall assembly. Refer to paragraph 7-4 for removal and replacement of soldered connections, indicator lamps, and indicator screen (lettered) inserts. Refer to paragraph 7-15 for repair of circuit card assemblies. Refer to figure 7-3 as an aid in disassembly of the panel.

7-7. Repair of POWER PANEL (2A1A3). Refer to paragraph 6-31 for removal and replacement of the overall assembly. Refer to paragraph 7-4 for removal and replacement of soldered connections, indicator lamps, and indicator screen (lettered) inserts. Refer to paragraph 7-15 for repair of circuit card assemblies. Refer to figure 7-4 as an aid in disassembly of the panel.

7-8. Repair of Control Panel 2A2A1. Refer to paragraph 6-31 for removal and replacement of the overall assembly. Refer to paragraph 7-4 for removal and replacement of soldered connections, indicator lamps and indicator screen (lettered) inserts. Refer to paragraph 7-15 for repair of circuit card assemblies. Use figure 7-5 as an aid in disassembly and assembly of the panel.

7-9. Repair of Servo Amplifier Panel (2A2A2).

a. Refer to paragraph 6-31 for removal and replacement of the overall assembly. Refer to paragraph 7-4 for removal and replacement of soldered connections, indicator lamps, and indicator screen (lettered) inserts. Refer to paragraph 7-15 for repair of circuit card assemblies. Use figures 7-6, 7-7 and 7-8 as an aid in disassembly and assembly of the panel.

b. R1 should be physically aligned as follows:

(1) Connect the potentiometer properly (for schematic, see fig. FO-9).

(2) Set the TEST SELECT switch (S1) to the DEAD BAND position.

(3) Remove the A1 circuit card assembly.

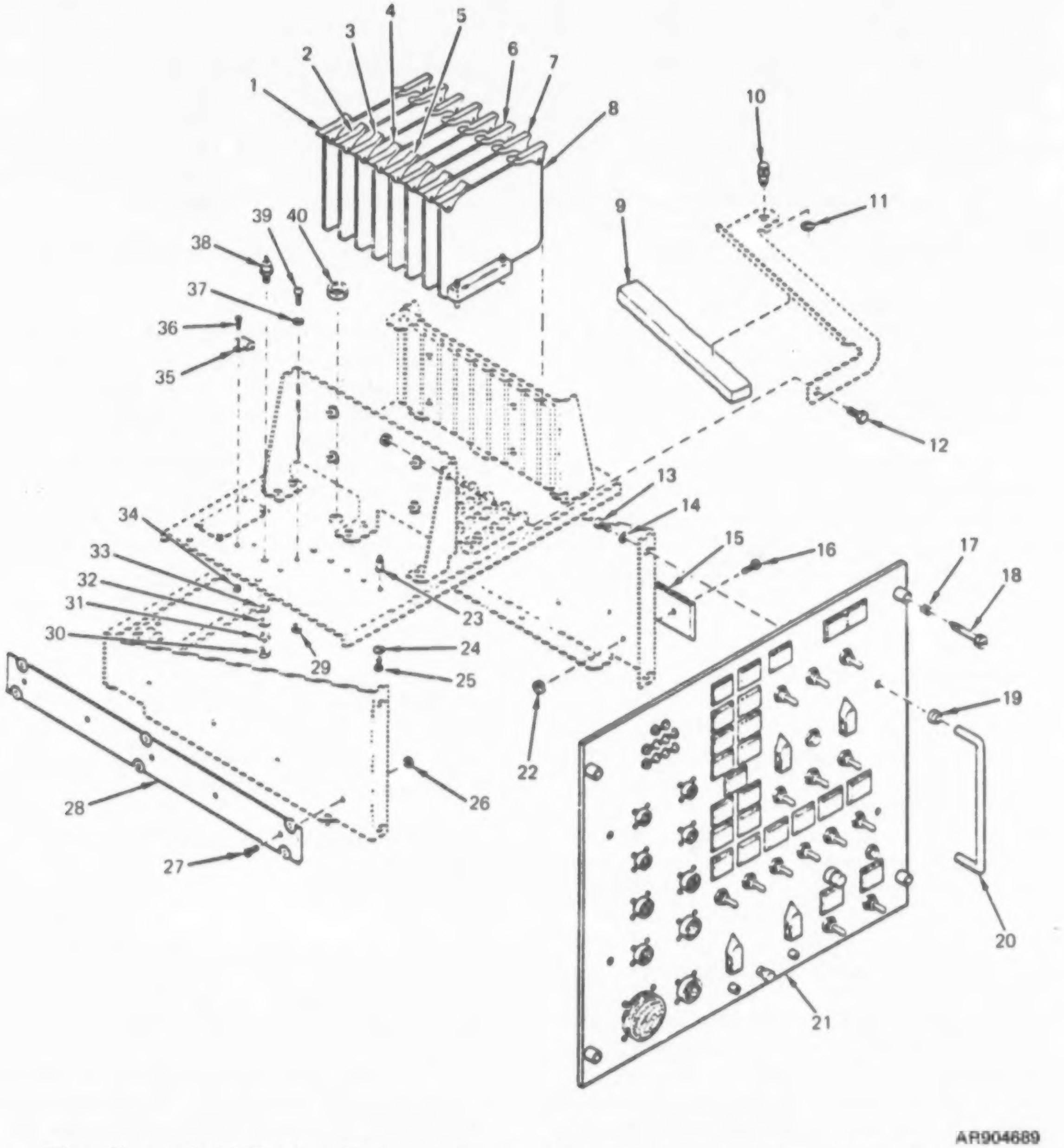
(4) Loosen the three cleats which hold R1 to the bracket (see figure 7-8).

(5) Connect the multimeter between pins 3 and 4 of potentiometer R1.

(6) Set the multimeter FUNCTION to Ω and RANGE to AUTO. Hold the HAND CONTROL knob on zero and rotate R1 until the multimeter reads zero. Tighten the cleats securing R1 in place.

(7) Reinstall A1 circuit card in panel and secure with hinged bracket.

7-10. Repair of Motor Load Assembly (2A2A4A1). Motor assembly repair consists of replacing motors, tachometer, gears, and bearings. Refer to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1. Circuit card (A8)
2. Circuit card (A7)
3. Circuit card (A6)
4. Circuit card (A5)
5. Circuit card (A4)
6. Circuit card (A3)
7. Circuit card (A2)
8. Circuit card (A1)
9. Cushion
10. Stud, turnlock
11. Nut, push-on
12. Bolt
13. Screw
14. Washer
15. Slide
16. Screw
17. Spring
18. Screw
19. Ferrule
20. Handle
21. Panel assembly
22. Nut
23. Stud, terminal
24. Washer
25. Screw
26. Nut
27. Screw
28. Slide
29. Nut
30. Nut
31. Washer
32. Washer
33. Lug
34. Nut
35. Resistor (R1)
36. Screw
37. Washer
38. Diode (CR1)
39. Screw
40. Grommet

Figure 7-3. Distribution box panel 2A1A2 (sheet 1 of 2).

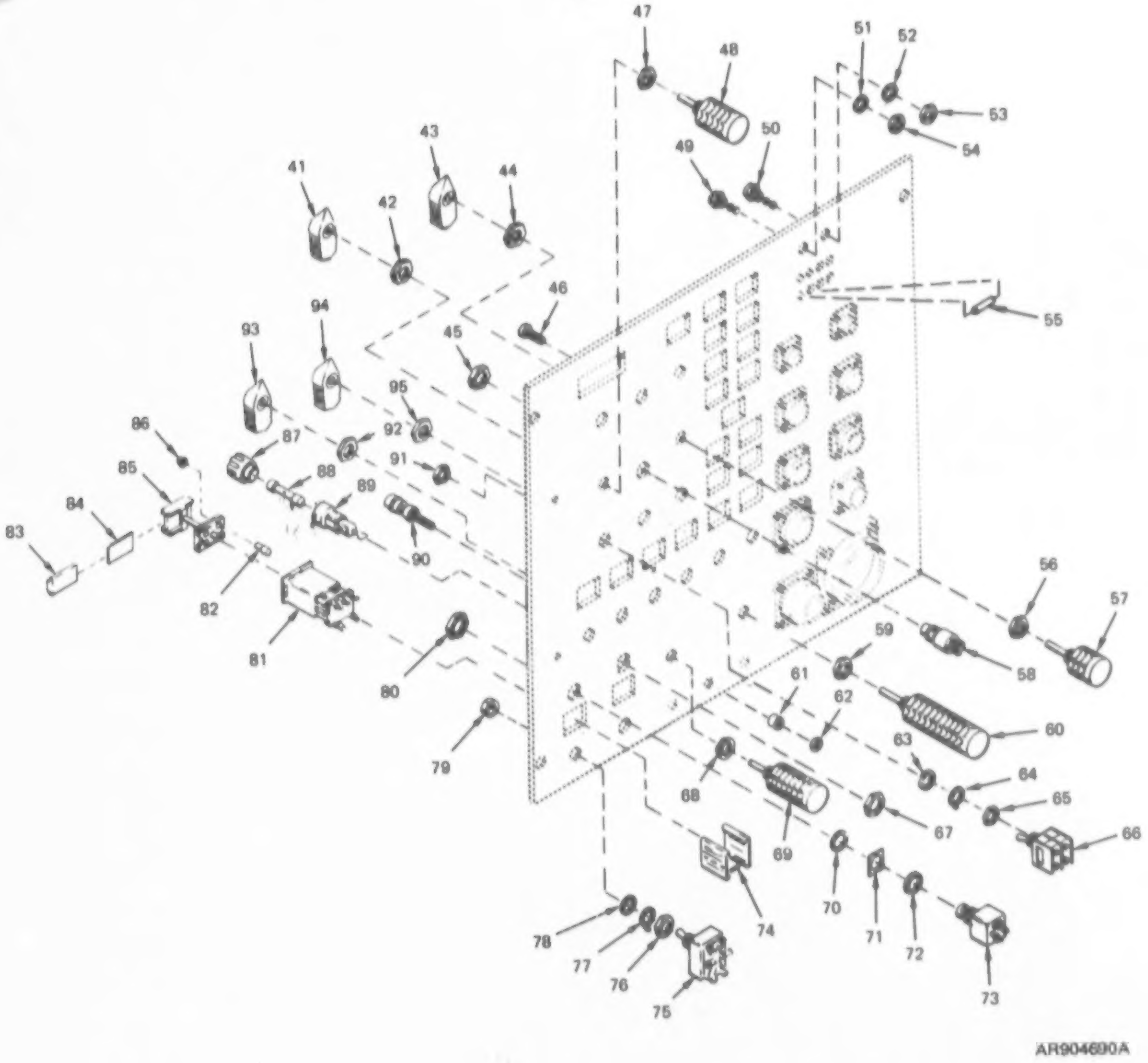
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Figure 7-3. Distribution box panel 2A1A2 (sheet 2 of 2).

Legend for figure 7-3 (sheet 2 of 2):

41. Knob
42. Nut
43. Knob
44. Nut
45. Nut
46. Screw
47. Nut
48. Switch, rotary (S8)
49. Jack tip (TP2, TP4, TP11)
50. Jack tip (TP1)
51. Washer
52. Washer
53. Nut
54. Nut
55.1 Resistor (R2)
56 Nut
57. Switch, rotary (S4)
58. Switch, pushbutton, momentary (S19)
59. Nut
60. Switch, rotary (S17)
61. Washer
62. Nut
63. Washer
64. Washer, locating
65. Nut
66. Switch, toggle (S1)
67. Nut
68. Nut
69. Switch, rotary (S18)
70. Washer
71. Washer, locating
72. Spacer, threaded
73. Circuit breaker (CB1)
74. Fastener clamp
75. Switch, toggle (S16)
76. Nut
77. Washer, locating
78. Washer
79. Nut
80. Nut
81. Indicator (DS4)
82. Lamp
83. Lens
84. Screen
85. Lens and lamp assembly
86. Cap
87. Cover
88. Fuse (F1)
89. Fuse holder
90. Binding post
91. Nut
92. Nut
93. Knob
94. Knob
95. Nut

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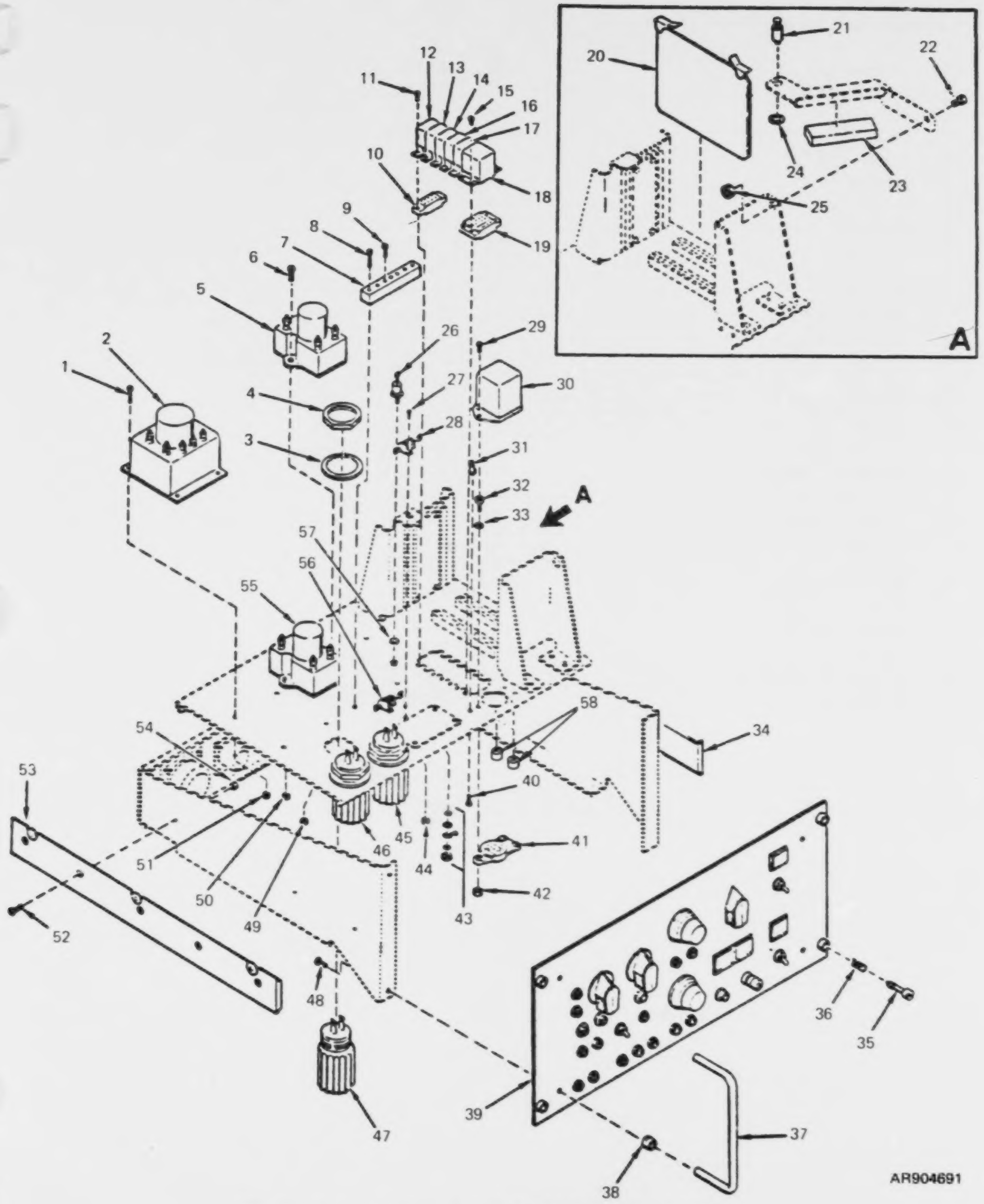
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Figure 7-4. Power panel 2A1A3 (sheet 1 of 2).

Legend for figure 7-4 (sheet 1 of 2):

1. Screw
2. Relay (K9)
3. Washer
4. Nut
5. Relay (K2)
6. Screw
7. Bus bar
8. Screw
9. Screw
10. Socket, relay
11. Screw
12. Relay (K5)
13. Relay (K6)
14. Relay (K7)
15. Screw
16. Relay (K8)
17. Relay (K10)
18. Relay (K3)
19. Socket, relay
20. Circuit card
21. Stud, turnlock
22. Screw
23. Pad
24. Nut, push-on
25. Nut
26. Diode (CR1)
27. Screw
28. Resistor (R9)
29. Screw
30. Relay (K4)
31. Stud, terminal
32. Screw, assembled
33. Washer
34. Slide
35. Screw
36. Spring
37. Handle
38. Ferrule
39. Panel assembly
40. Screw
41. Socket, relay
42. Nut
43. Diode insulating kit with terminal lug
44. Nut
45. Resistor (R4)
46. Resistor (R3)
47. Resistor (R5)
48. Screw
49. Nut
50. Nut
51. Nut
52. Screw
53. Slide
54. Nut
55. Relay (K1)
56. Resistor (R8)
57. Washer, insulating
58. Ferrule

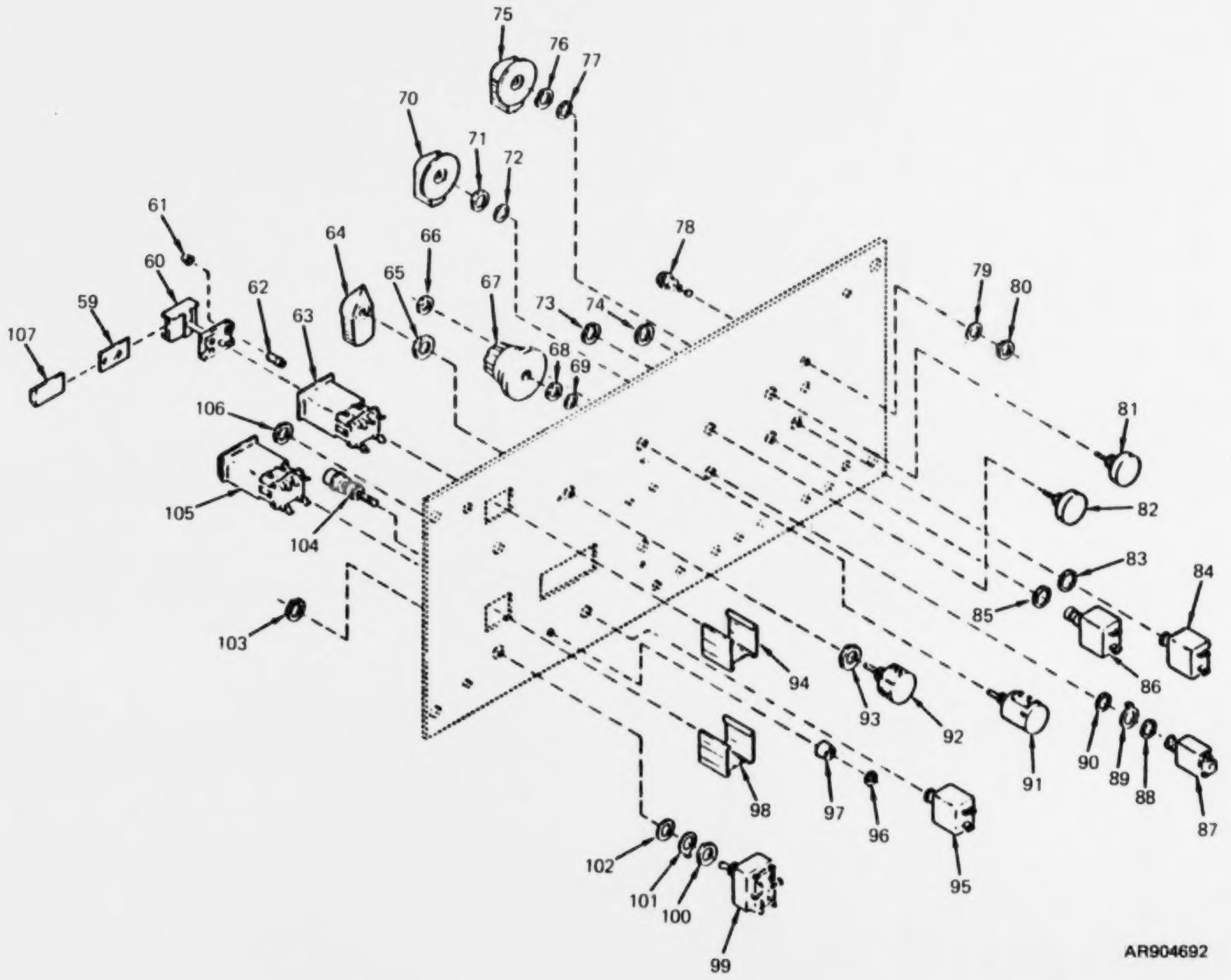
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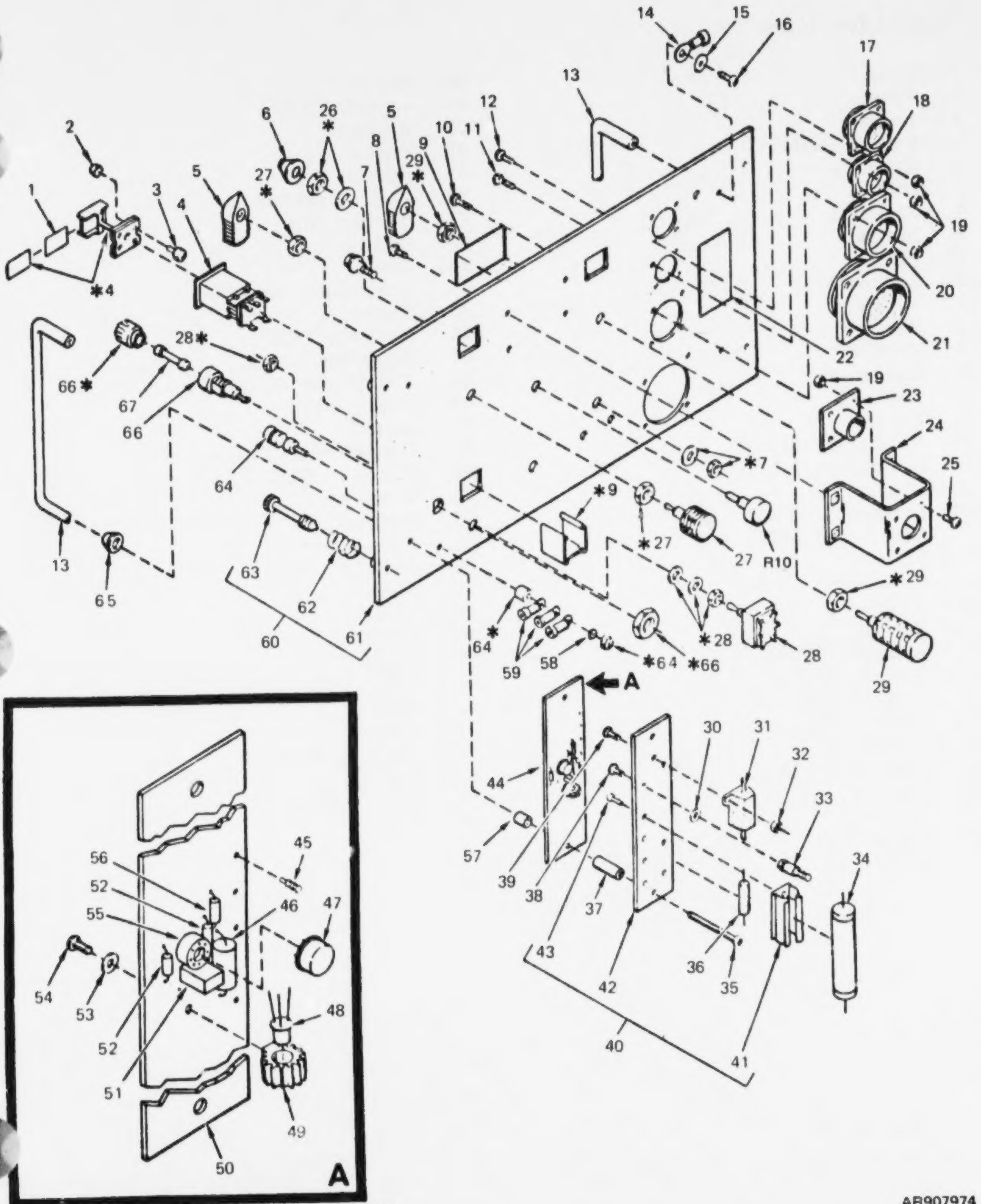
Figure 7-4. Power panel 2A1A3 (sheet 2 of 2).

Legend for figure 7-4 (sheet 2 of 2):

59. Screen
60. Lens and lamp assembly
61. Cap
62. Lamp
63. Indicator (DS4)
64. Knob
65. Nut
66. Nut
67. Knob
68. Nut
69. Washer
70. Knot
71. Nut
72. Washer
73. Nut
74. Nut
75. Knob
76. Nut
77. Washer
78. Jack, tip (TP1 thru TP10) (TP12 thru TP15)
79. Washer
80. Nut
81. Potentiometer (R1)
82. Potentiometer (R2)
83. Washer
83. Circuit breaker (CB2)
85. Washer
86. Circuit breaker (CB3)
87. Circuit breaker (CB4)
88. Washer
89. Locating washer
90. Washer
91. Potentiometer (R7)
92. Switch, rotary (S1)
93. Nut
94. Fastener clamp
95. Circuit breaker (CB1)
96. Nut
97. Washer
98. Fastener clamp
99. Switch, toggle (S1)
100. Nut
101. Locating washer
102. Washer
103. Nut
104. Binding post
105. Indicator (DS3)
106. Nut
107. Lens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*SUPPLIED WITH IDENTICALLY NUMBERED PART

Figure 7-5. Control panel 2A2A1.

Legend for figure 7-5:

1. Insert
2. Filter
3. Lamp
4. Switch module
5. Knob
6. Dial
7. Jack tip
8. Screw
9. Plate
10. Screw
11. Screw
12. Screw
13. Handle
14. Terminal
15. Washer
16. Screw
17. Connector (J24)
18. Connector (J31)
19. Nut
20. Connector (J23)
21. Connector (J22)
22. Plate
23. Connector (J114)
24. Bracket
25. Screw
26. Resistor (R10)
27. Switch (S4)
28. Switch (S3)
29. Switch (S2)
30. Washer
31. Resistor (R1)
32. Nut
33. Terminal
34. Capacitor
35. Screw
36. Resistor (R2)
37. Spacer
38. Screw
39. Screw
40. Plate assembly
41. Spring clip
42. Plate
43. Rivet
44. Component assembly
45. Terminal
46. Resistor (R2)
47. Amplifier (AR1)
48. Transistor (Q1)
49. Heat sink
50. Board
51. Capacitor (C1)
52. Resistor (R3, R4)
53. Washer
54. Screw
55. Pad
56. Resistor (R1)
57. Spacer
58. Washer
59. Terminal
60. Panel
61. Panel
62. Spring
63. Screw
64. Binding post
65. Ferrule
66. Fuse holder
67. Fuse

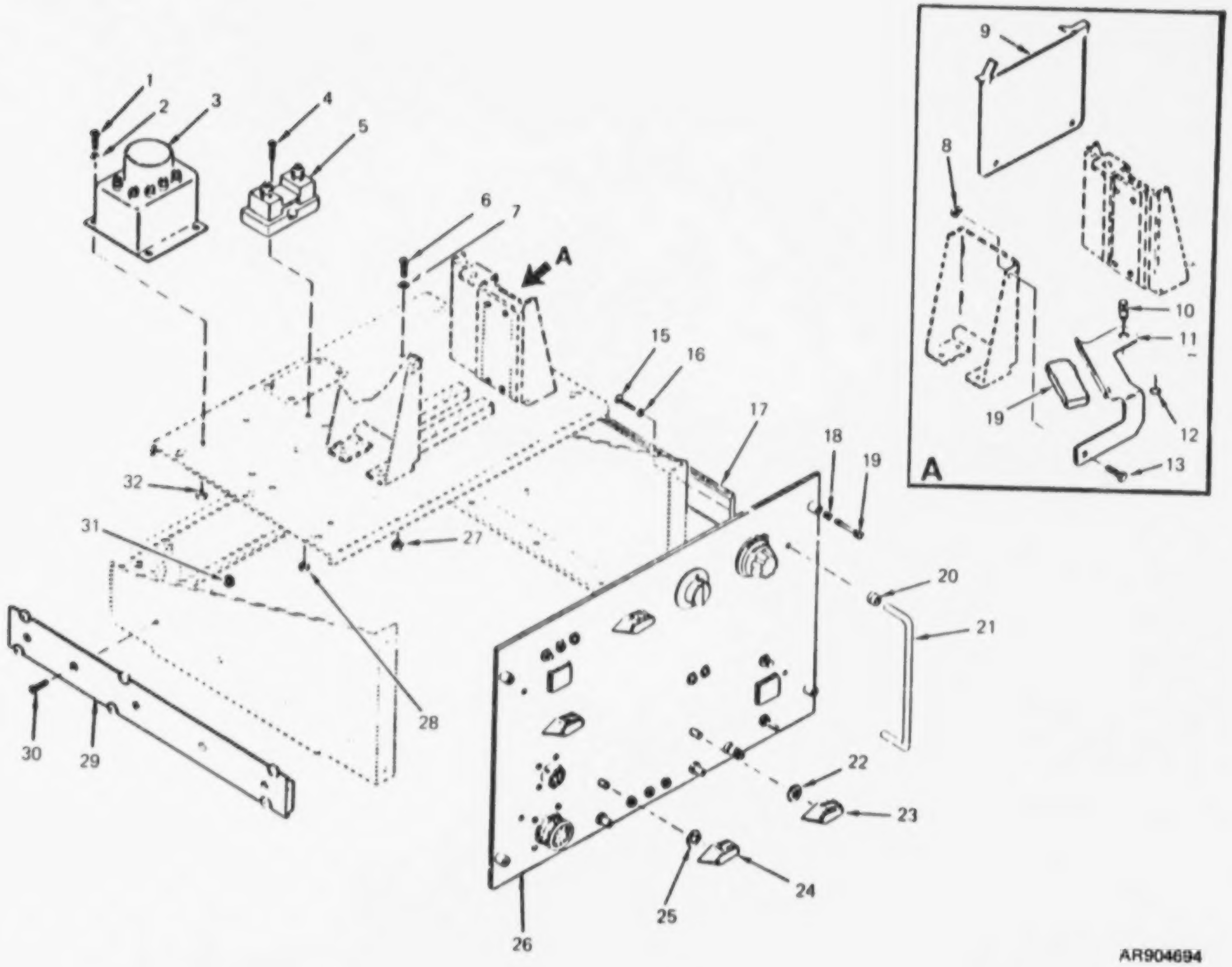
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Figure 7-6. Servo amplifier panel 2A2A2.

Legend for figure 7-6:

1. Screw
2. Washer
3. Relay
4. Screw
5. Shunt
6. Screw
7. Washer
8. Nut
9. Circuit card (A1)
10. Stud turnlock
11. Bracket hinged
12. Nut, push on
13. Bolt
14. Pad
15. Screw
16. Washer
17. Slide
18. Spring
19. Screw
20. Ferrule
21. Handle
22. Nut
23. Knob
24. Knob
25. Nut
26. Panel assembly
27. Nut
28. Nut
29. Slide
30. Screw
31. Nut
32. Nut

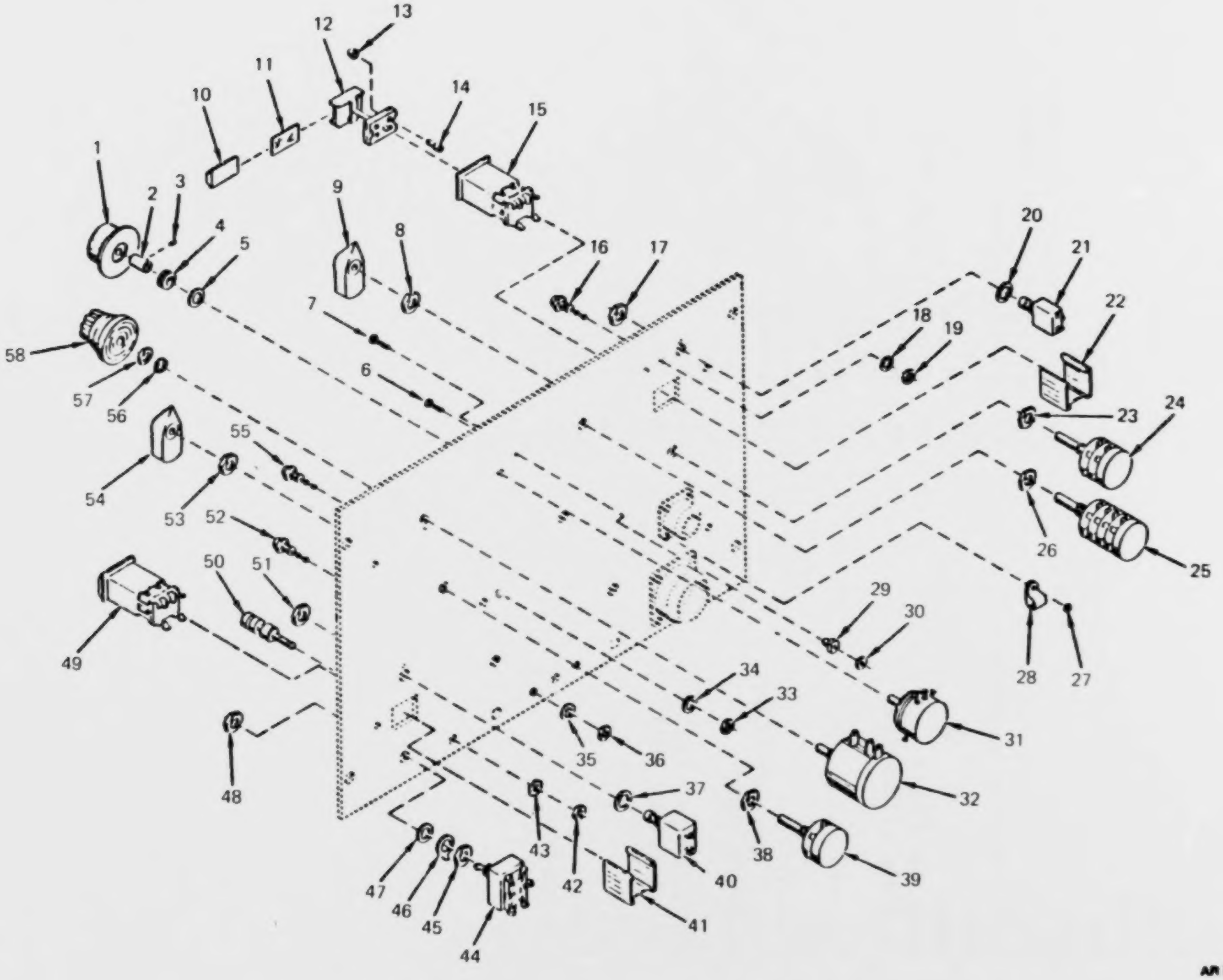
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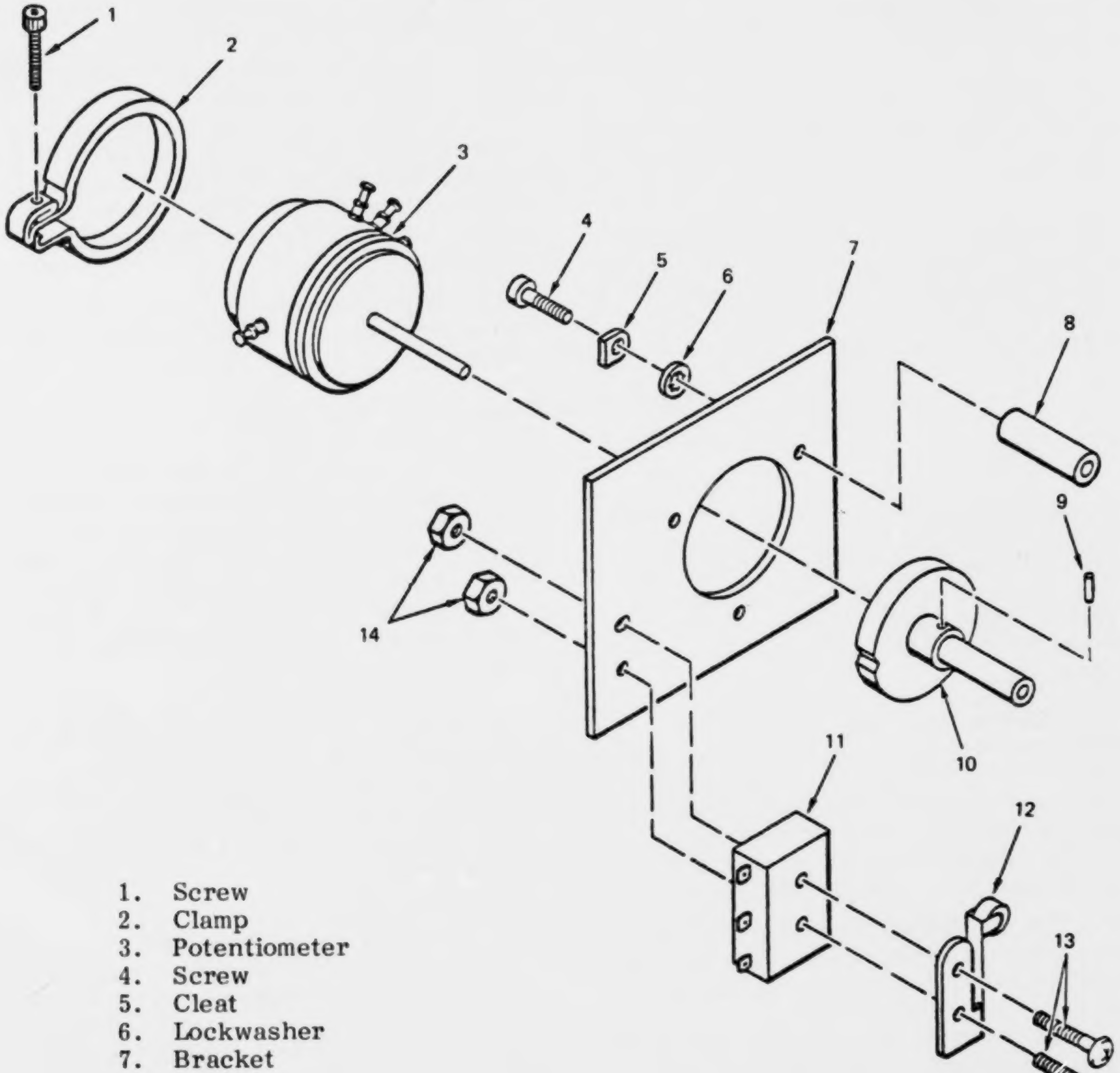
Figure 7-7. Servo amplifier panel 2A2A2, rear view.

Legend for figure 7-7:

1. Knob
2. Adapter, sleeve
3. Set screw
4. Grommet
5. Washer
6. Screw
7. Screw
8. Nut
9. Knob
10. Lens
11. Screen
12. Lens and lamp assembly
13. Cap
14. Lamp
15. Indicator (DS1)
16. Jack tip (TP5, TP6)
17. Nut
18. Washer
19. Nut
20. Washer
21. Circuit breaker (CB1)
22. Fastener clamp
23. Nut
24. Switch rotary (S2)
25. Switch rotary (S1)
26. Nut
27. Nut
28. Clamp
29. Rim clamp
30. Nut
31. Potentiometer (R1)
32. Potentiometer (R2)
33. Nut
34. Washer
35. Washer
36. Nut
37. Washer
38. Nut
39. Switch rotary (S5, S6)
40. Circuit breaker (CB2)
41. Fastener clamp
42. Nut
43. Washer
44. Switch, toggle (S9)
45. Nut
46. Locating washer
47. Washer
48. Nut
49. Indicator assembly
50. Binding post (TP4)
51. Nut
52. Jack tip (TP1, TP2, TP3)
53. Nut
54. Knob
55. Jack tip (TP7, TP8)
56. Washer
57. Nut
58. Dial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1. Screw
2. Clamp
3. Potentiometer
4. Screw
5. Cleat
6. Lockwasher
7. Bracket
8. Standoff
9. Setscrew
10. Adapter cam
11. Microswitch
12. Actuator switch
13. Screw
14. Nut

Figure 7-8. Servo amplifier panel 2A2A2, resistor assembly (10556462).

figure 7-9 as an aid in disassembly of the motor load, except that the front plate (10) and plate (11) must be unbolted and separated in order to replace the bearings and gears.

7-11. Repair of Electronic Component Assembly (2A2A4A3). Refer to figures 6-10 and 7-10 as an aid in disassembly of the electronic component.

7-12. Repair of SCG Servo Test Panel (2A2A6). Refer to paragraph 6-31 for removal and replacement of the overall assembly. Refer to paragraph 7-4 for removal and replacement of components with soldered connections. Refer to paragraph 7-10 for repair of circuit card assemblies. Refer to figure 7-11 as an aid in disassembly of the panel.

7-13. Repair of Inverter/Converter Test Panel (2A2A4). Refer to paragraph 6-31 for removal and replacement of the overall assembly. Refer to paragraph 7-4 for removal and replacement of components with soldered connections. Refer to figure 7-12 as an aid in disassembly of the panel.

7-14. Repair of Access Panel. Refer to figure 7-13 as an aid in disassembly of the panel.

Section III. REPAIR OF CIRCUIT CARD ASSEMBLIES

7-15. General.

a. All components on the AN/TSM-100 circuit card assemblies are replaceable at the DS maintenance level. Refer to circuit card schematics and component layouts in figures FO-12 through FO-25 when making repairs or replacing components.

b. Remove (unplug) circuit card assemblies from their connectors by pulling in a straight line to prevent bending the connector pins. When removing cards (fig. 7-3, sheet 1 of 2), operate the extractors simultaneously so that the card is withdrawn in a straight line.

7-16. Typical Repair Procedures. Repairs to circuit cards should be performed carefully, keeping the following in mind:

a. Use minimum heat to melt solder around component leads that must be disconnected.

b. Pick up excess solder around the connection by passing a bare stranded wire back and forth through the connection while the solder is in the molten state. Also remove any solder that splashes onto other areas of the circuit card assembly when the component is removed.

c. Refer to the appropriate figure on component layout in figures FO-12 through FO-25; position the replacement component and trim the leads to the correct length. Use attaching hardware as applicable.

d. Heat the connection until solder flows onto the lead and the connecting point; remove heat immediately.

e. Do not allow the connection to be disturbed until the molten solder has hardened.

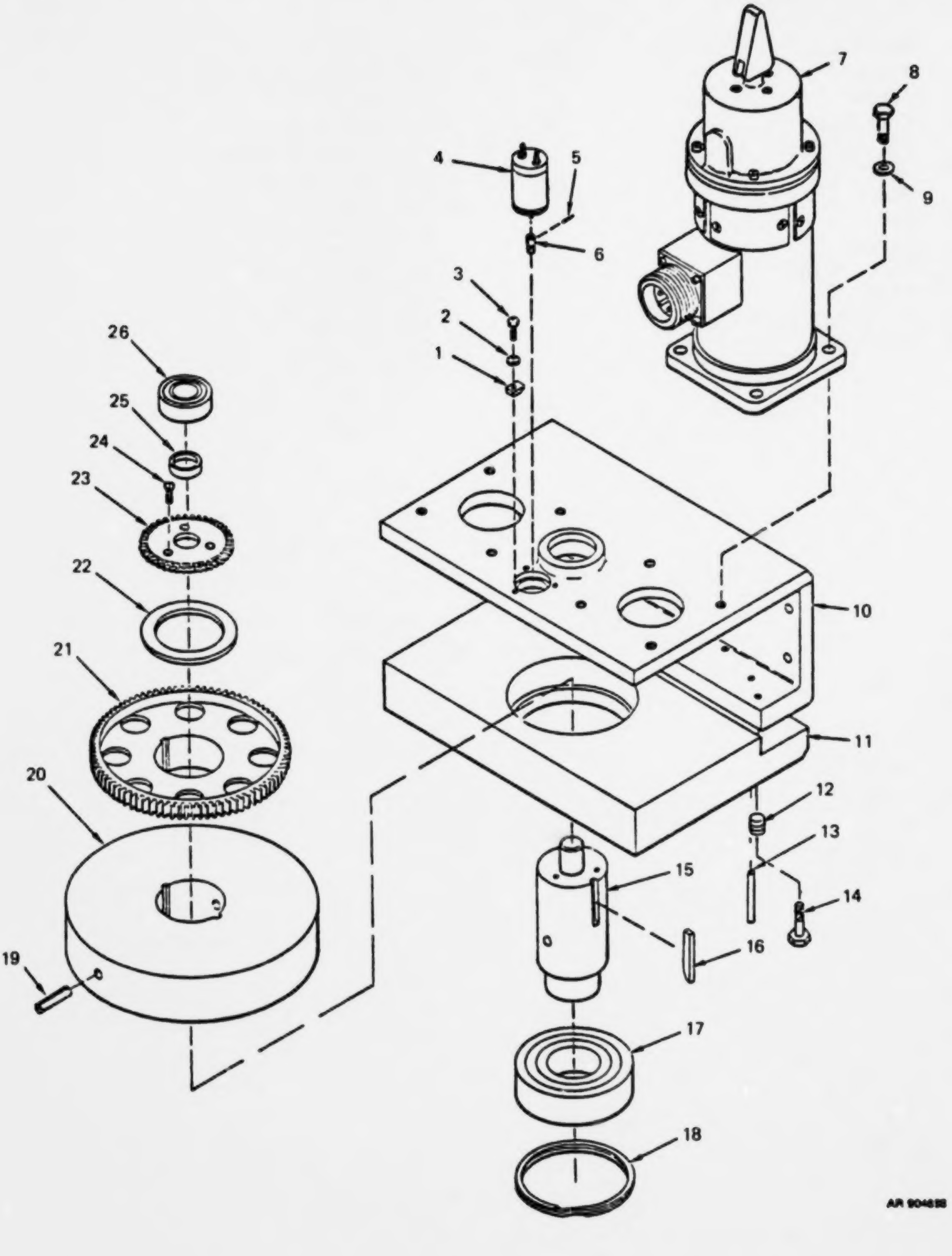
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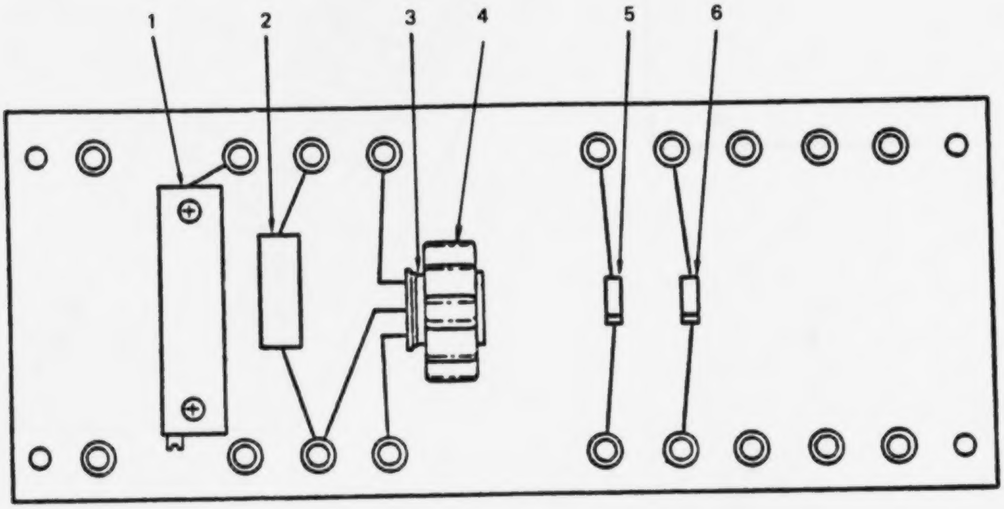
Figure 7-9. Motor load assembly 2A2A4A1, partially exploded view.

Legend for figure 7-9:

1. Rim clamp
2. Washer
3. Screw
4. Tachometer (G1)
5. Pin, spring
6. Gear
7. Motor
8. Bolt
9. Washer
10. Plate, front
11. Plate
12. Threaded insert
13. Pin, guide
14. Bolt
15. Shaft, shouldered
16. Key
17. Bearing
18. Ring, retaining
19. Pin, spring
20. Flywheel
21. Gear
22. Spacer
23. Gear
24. Screw
25. Washer
26. Bearing



1. Resistor (R8)
2. Resistor (R7)
3. Transistor (Q1)
4. Heat sink
5. Diode (CR3)
6. Diode (CR4)

Figure 7-10. Resistor bracket assembly 2A2A4A3.

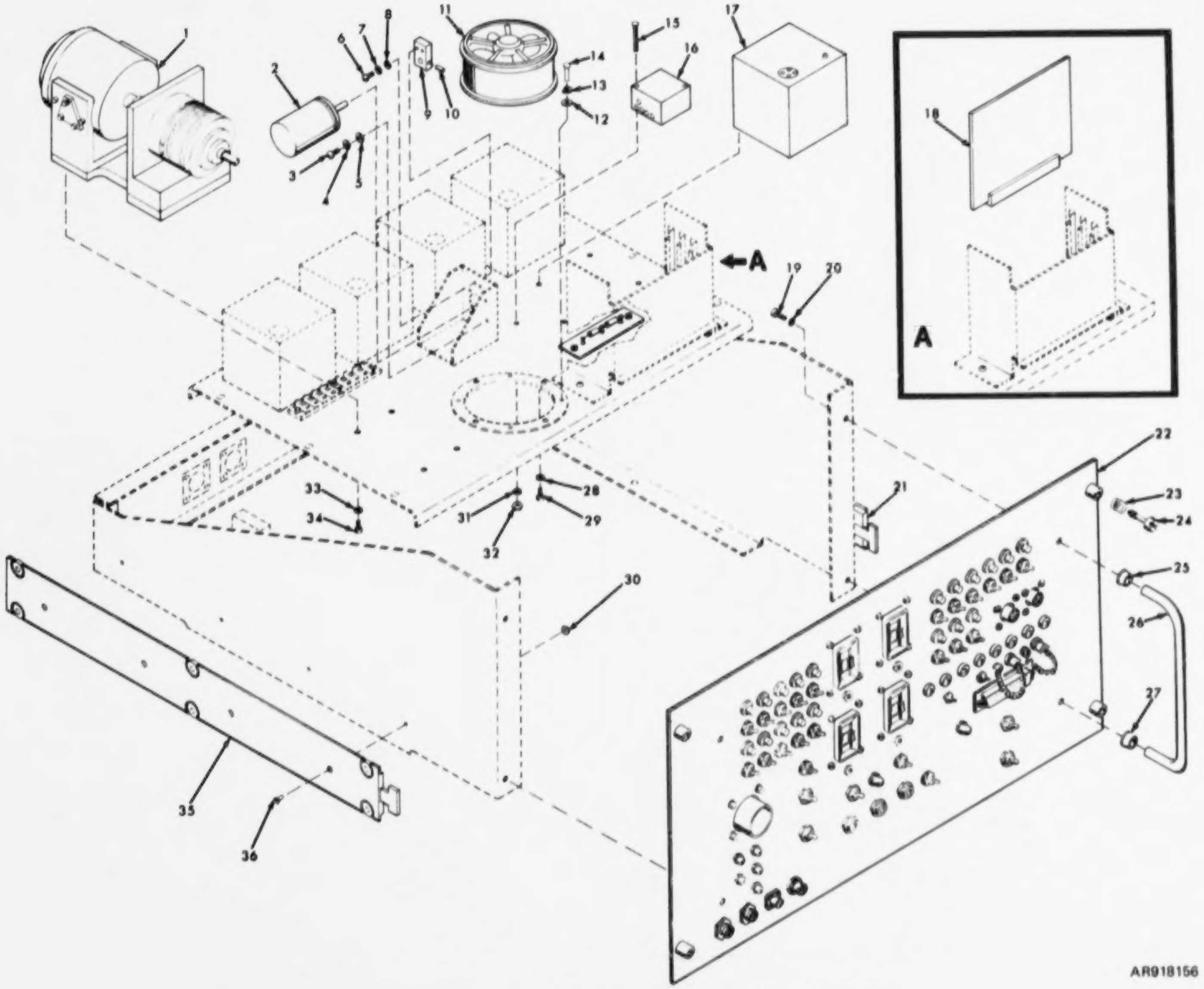

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Figure 7-11. SCG servo test panel 2A2A6 (sheet 1 of 2).

Legend for figure 7-11 (sheet 1 of 2):

1. Motor assembly
2. Synchro
3. Screw
4. Cleat
5. Washer
6. Screw
7. Washer
8. Washer
9. Plate
10. Set screw
11. Fan
12. Washer
13. Cleat
14. Screw
15. Screw
16. Transformer
17. Power supply
18. Circuit card
19. Screw
20. Washer
21. Slide (right)
22. Panel
23. Spring
24. Screw
25. Ferrule
26. Handle
27. Ferrule
28. Washer
29. Screw
30. Nut
31. Washer
32. Nut
33. Washer
34. Screw
35. Slide (left)
36. Screw

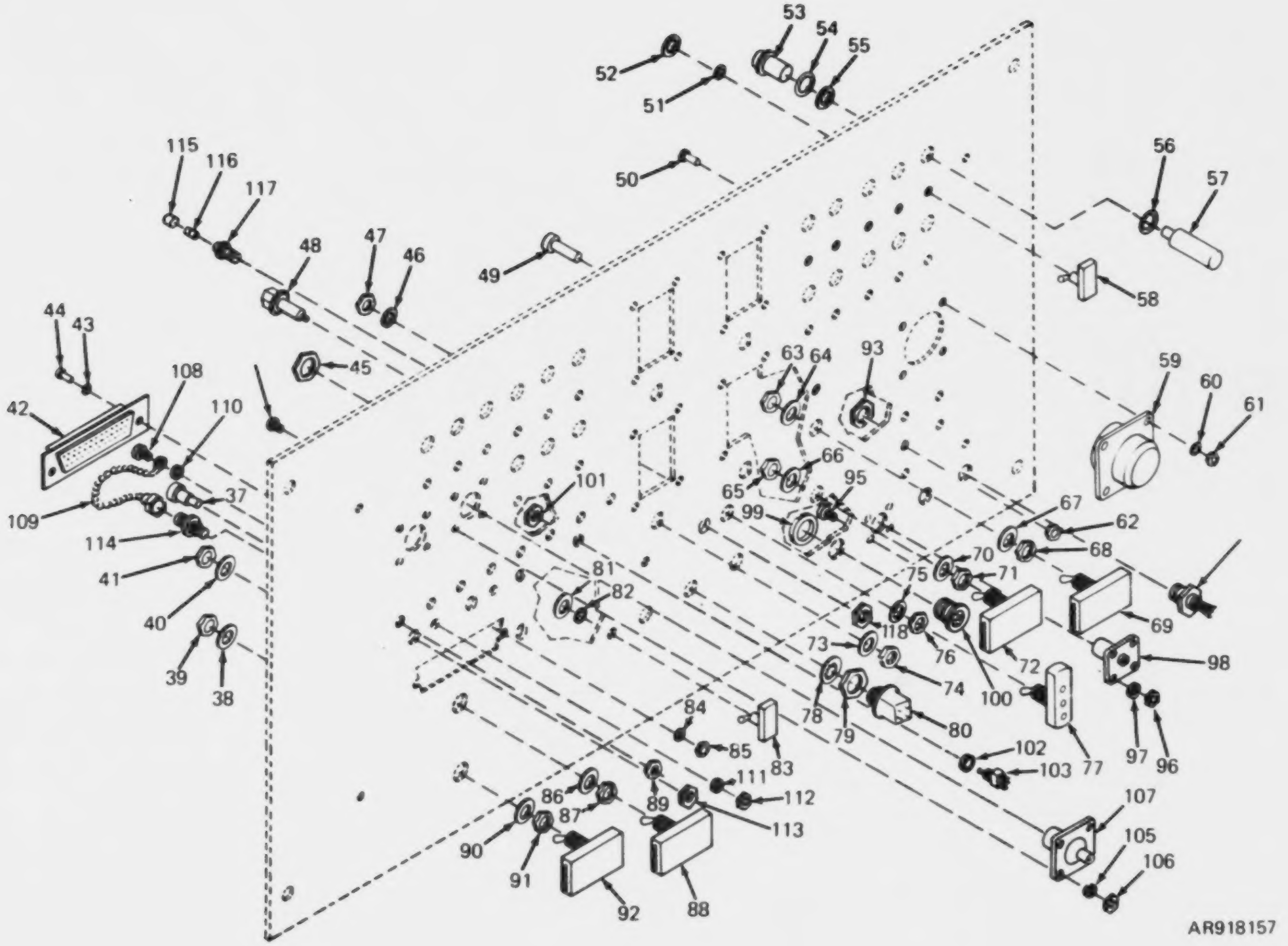
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Figure 7-11. SCG servo test panel 2A2A6 (sheet 2 of 2).

Legend for figure 7-11 (sheet 2 of 2):

37. Jack (8)
38. Washer
39. Nut
40. Washer
41. Nut
42. Connector
43. Washer
44. Screw
45. Nut
46. Washer
47. Nut
48. Post
49. Connector
50. Screw
51. Washer (21)
52. Nut (ring) (21)
53. Lens (19)
54. Washer (19)
55. Nut (19)
56. Gasket (19)
57. Light (19)
58. Switch (S5 thru S23, S31, S3)
59. Connector
60. Washer
61. Nut
62. Nut
63. Nut
64. Washer
65. Nut
66. Washer
67. Washer
68. Nut
69. Switch (S24)
70. Washer
71. Nut
72. Switch (S27)
73. Washer
74. Nut
75. Washer
76. Nut
77. Switch (S25)
78. Washer
79. Nut
80. Switch (S28, S29, S30)
81. Nut (ring)
82. Washer
83. Switch (S3)
84. Washer
85. Nut
86. Washer
87. Nut
88. Switch (S1)
89. Nut
90. Washer
91. Nut
92. Switch (S2)
93. Nut
94. Connector
95. Screw
96. Nut
97. Washer
98. Connector
99. Ring
100. Connector
101. Nut
102. Nut
103. Switch
104. Screw
105. Washer
106. Nut
107. Connector
108. Screw
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114. Connector
115. Cap
116. Lamp
117. Socket
118. Nut

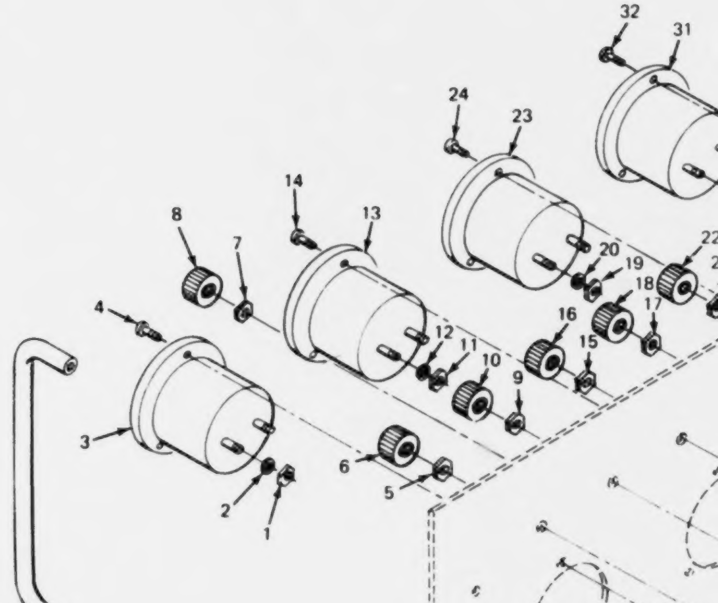
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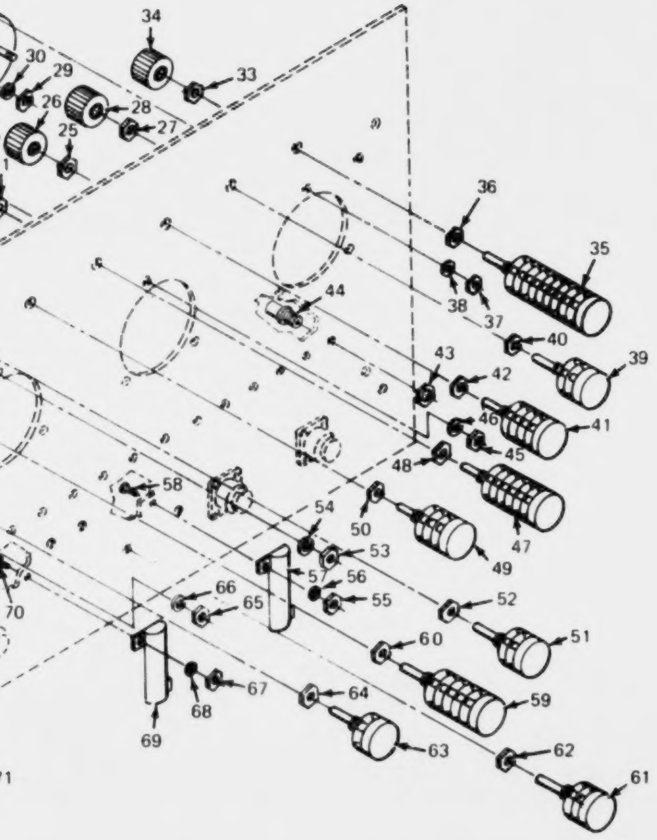
Figure 7-12. Inverter/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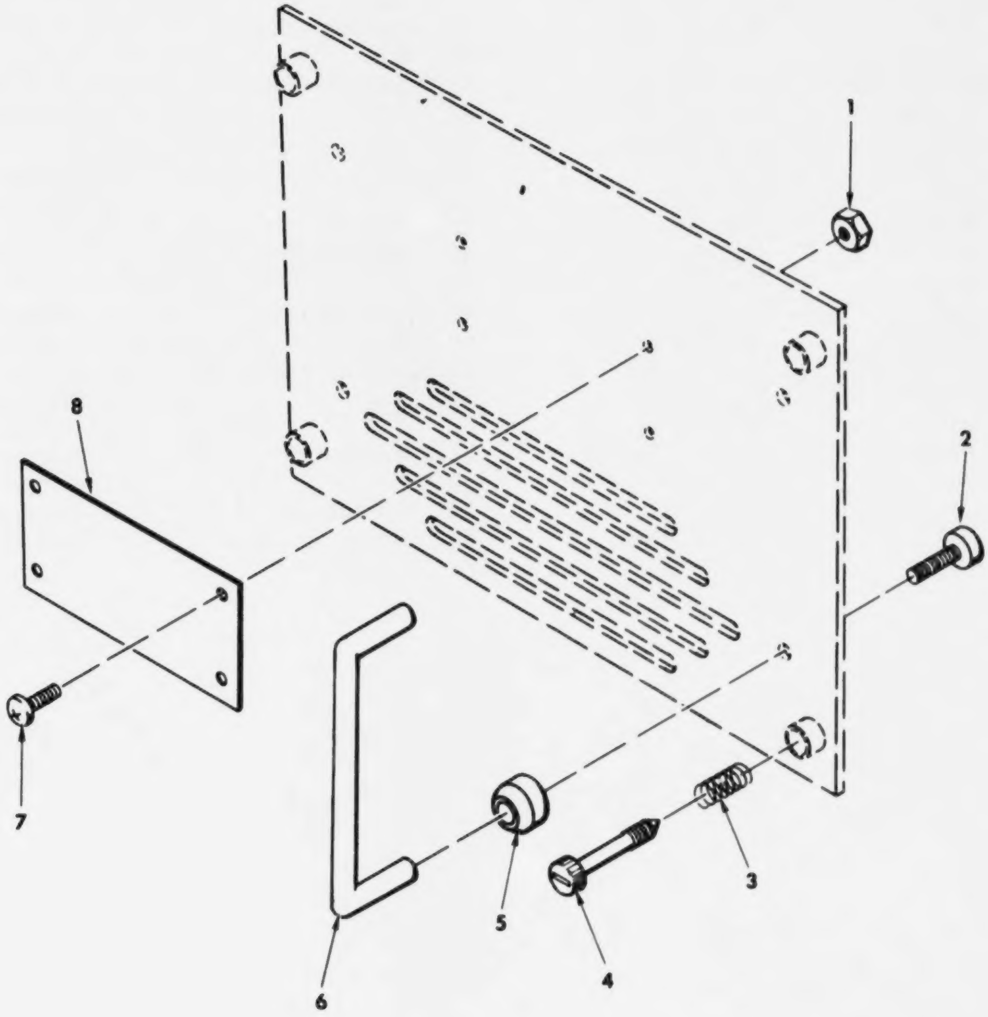
converter test panel 2A2A4.

Legend for figure 7-12:

1. Nut
2. Washer
3. Meter (M4)
4. Screw
5. Nut
6. Knob
7. Nut
8. Knob
9. Nut
10. Knob
11. Nut
12. Washer
13. Meter (M3)
14. Screw
15. Nut
16. Knob
17. Nut
18. Knob
19. Nut
20. Washer
21. Nut
22. Knob
23. Meter (M2)
24. Screw
25. Nut
26. Knob
27. Nut
28. Knob
29. Nut
30. Washer
31. Meter (M1)
32. Screw
33. Nut
34. Knob
35. Switch (S1)
36. Nut
37. Nut
38. Washer

39. Switch (S2)
40. Nut
41. Switch (S3)
42. Nut
43. Nut
44. Jack (23)
45. Nut
46. Washer
47. Switch (S4)
48. Nut
49. Switch (S5)
50. Nut
51. Switch (S6)
52. Nut
53. Nut
54. Washer
55. Nut
56. Washer
57. Resistor (R1)
58. Screw
59. Switch (S7)
60. Nut
61. Switch (S9)
62. Nut
63. Switch (S8)
64. Nut
65. Nut
66. Washer
67. Nut
68. Washer
69. Resistor (R2)
70. Screw
71. Nut
72. Clamp
73. Screw
74. Screw
75. Ferrule
76. Handle



1. Nut	5. Ferrule
2. Screw	6. Handle
3. Spring	7. Screw
4. Screw	8. Warning plate

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Figure 7-13. Typical access panel.

CHAPTER 8

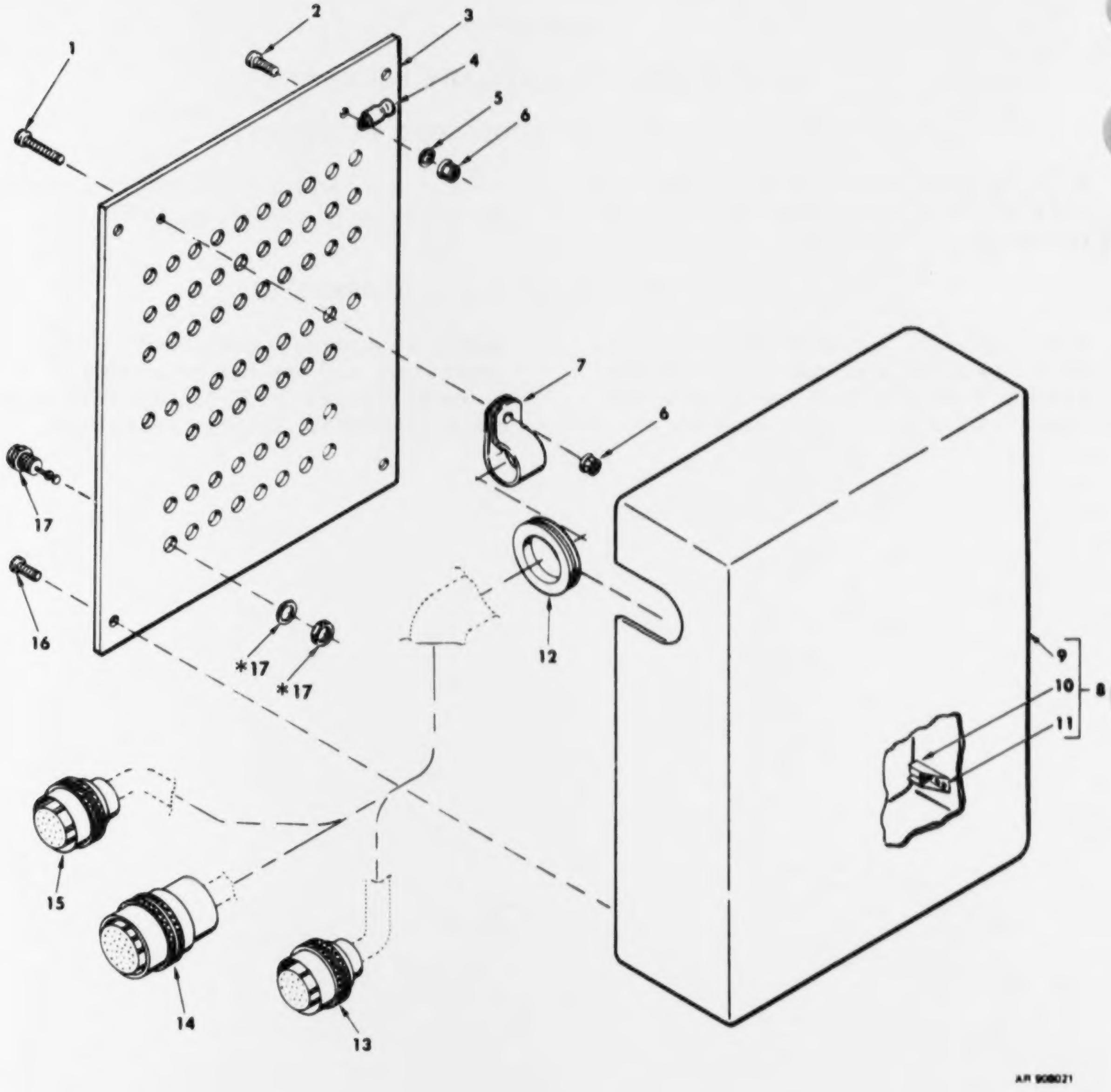
MAINTENANCE OF AUXILIARY EQUIPMENT

Section I. REPAIR OF ACCESSORY EQUIPMENT

8-1. General. Accessory equipment consists of test adapter assemblies and extender board assemblies. Refer to figures 8-1 and 8-2, and 8-9 through 8-21 as an aid in repair of these assemblies.

Section II. REPAIR OF CABLE ASSEMBLIES

8-2. General. Cable W123, connectors P113 and P118, and the two cables connecting P114 and P118 are replaceable items. All other cable assemblies are sealed with potting compound at the connectors and are not repairable. Refer to figures 8-22 through 8-73 as an aid in the repair of these assemblies.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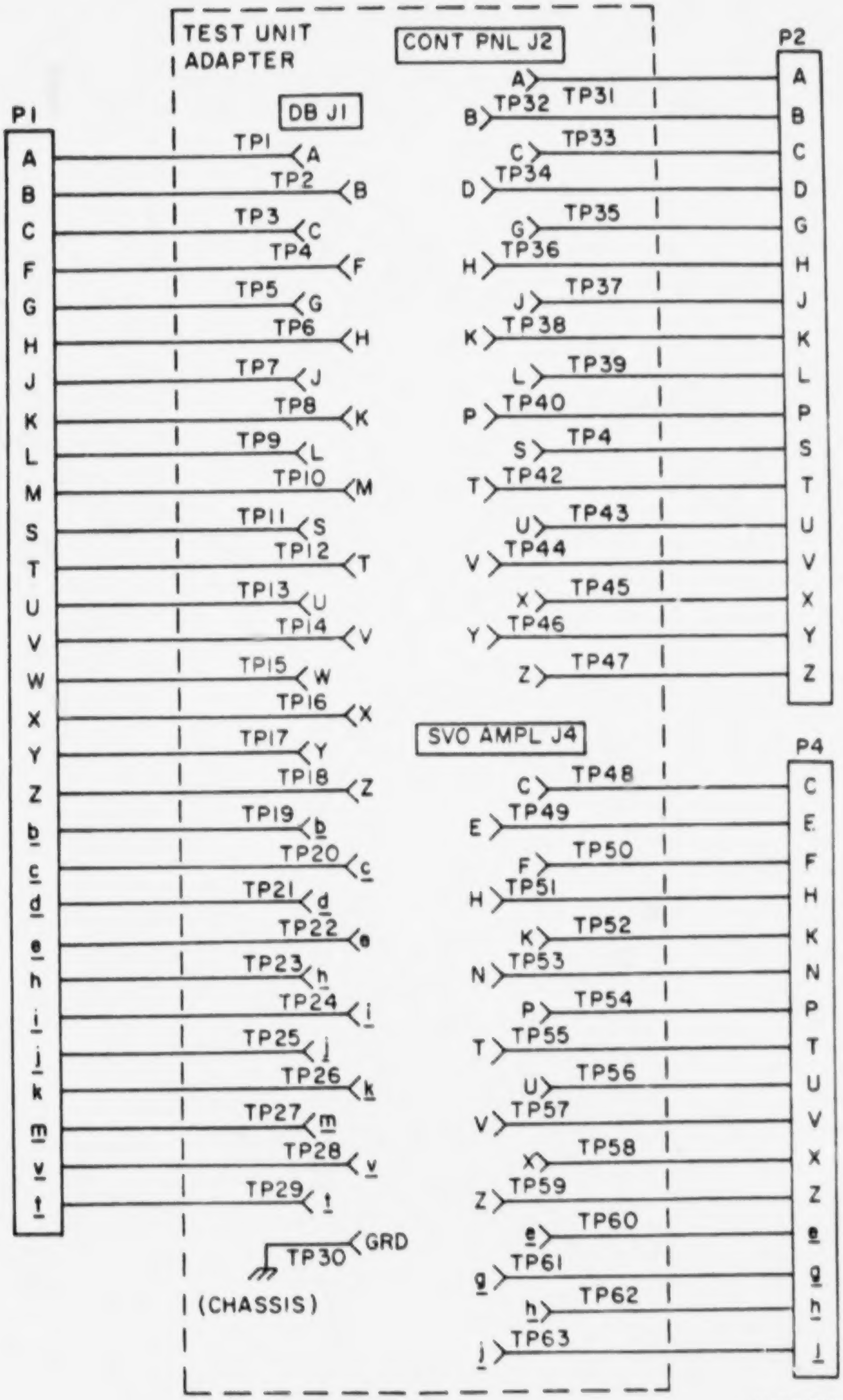
*SUPPLIED WITH IDENTICALLY NUMBERED PARTS

1. Screw
2. Screw
3. Panel
4. Terminal
5. Washer
6. Nut
7. Clamp
8. Box adapter
9. Box
10. Nut
11. Rivet
12. Grommet
13. Connector (P2)
14. Connector (P1)
15. Connector (P4)
16. Screw
17. Jack, tip

Figure 8-1. Test unit adapter, CP131 (10054265).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DB J1
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SVO AMPL J4
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TP2 B
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TP5 G
TP6 H
TP7 J
TP8 K
TP9 L
TP10 M
TP11 S
TP12 T
TP13 U
TP14 V
TP15 W
TP16 X
TP17 Y
TP18 Z
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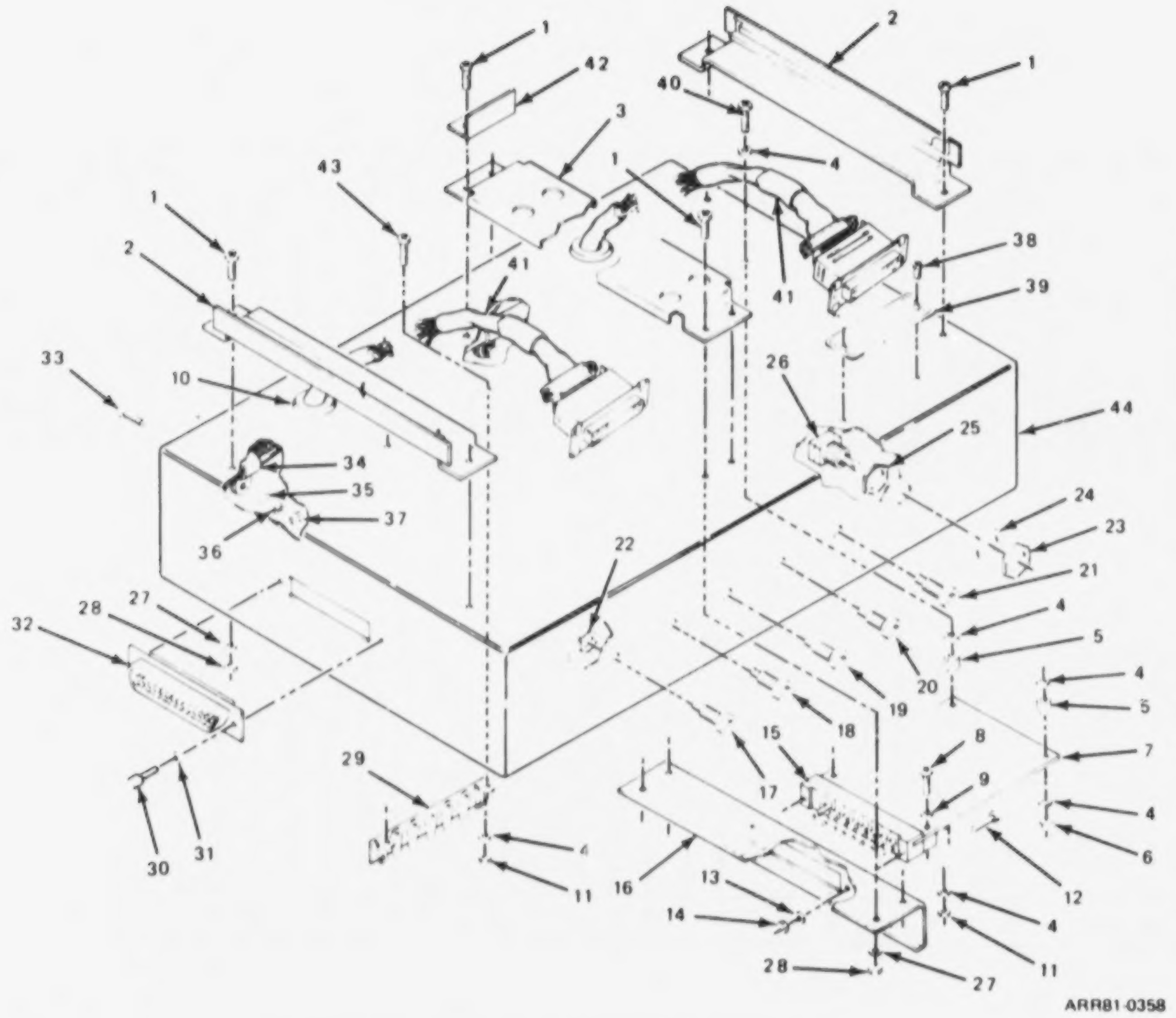
Figure 8-2. Test unit adapter CP131, detailed schematic.

All data on pages 8-4 thru 8-9, including figures 8-3, 8-4, 8-5, 8-6, 8-7, and 8-8, deleted.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ARR81-0358

Figure 8-9. Test set adapter TS3 (11748235).

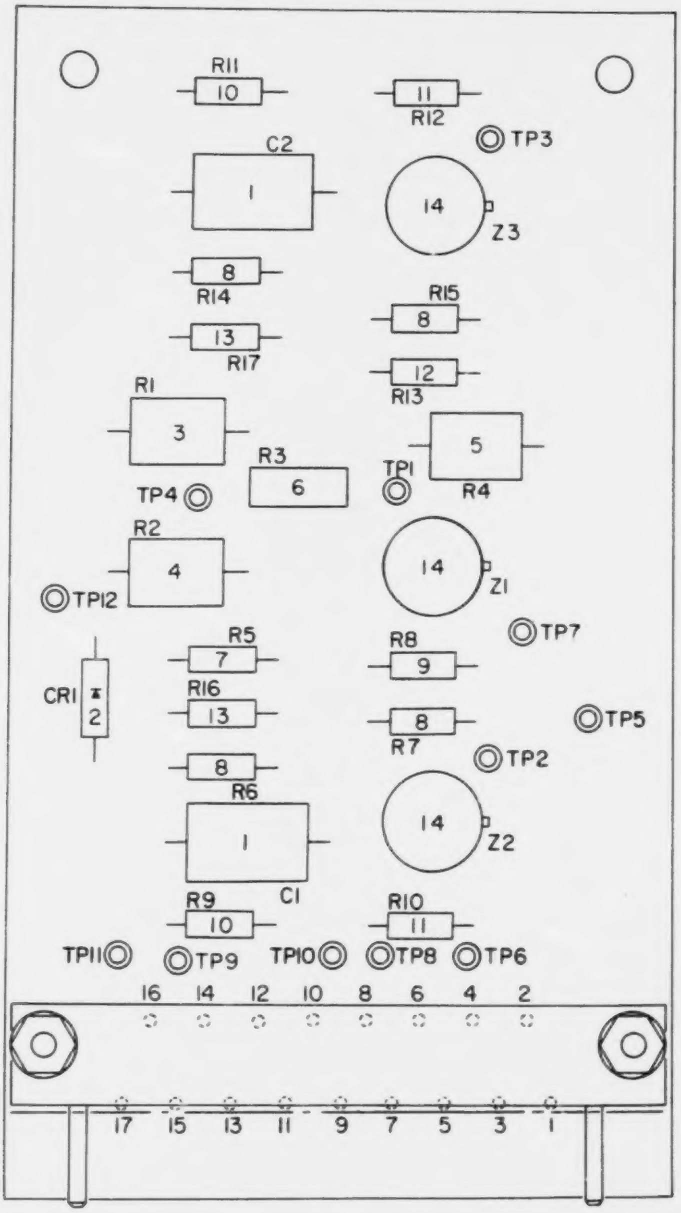
Legend for figure 8-9.

1. Screw
2. Retainer
3. Bracket
4. Washer
5. Spacer
6. Nut
7. Board
8. Screw
9. Washer
10. Grommet
11. Nut
12. Screw
13. Washer
14. Nut
15. Connector

1
1
1
1
2
2
2
2
2
2
2
2
2
2
3

6. Bracket
7. Jack
8. Jack
9. Jack
0. Jack
1. Jack
2. Nut
3. Nut
4. Washer
5. Nut
6. Switch
7. Washer
8. Nut
9. Terminal
0. Screw

31. Washer
32. Connector
33. Screw
34. Clamp
35. Washer
36. Washer
37. Nut
38. Screw
39. Plate
40. Screw
41. Cable assembly
42. Bracket
43. Screw
44. Chassis


R11
10
11
R12
TP3
C2
1
14
Z3
8
R14
R15
8
13
R17
12
R13
R1
3
5
R3
6
TP1
R4
TP4
R2
4
14
Z1
TP12
TP7
R5
7
R8
9
CR1
2
R16
13
8
TP5
R7
TP2
8
R6
14
Z2
1
R9
C1
R10
10
11
TP11
TP9
TP10
TP8
TP6
16 14 12 10 8 6 4 2
17 15 13 11 9 7 5 3 1

ARR81-0360

Legend for figure 8-10

1. Capacitor
2. Diode
3. Resistor
4. Resistor
5. Resistor
6. Resistor
7. Resistor
8. Resistor
9. Resistor
10. Resistor
11. Resistor
12. Resistor
13. Resistor
14. Integrated circuit

Figure 8-10. Test set adapter TS3 circuit card.

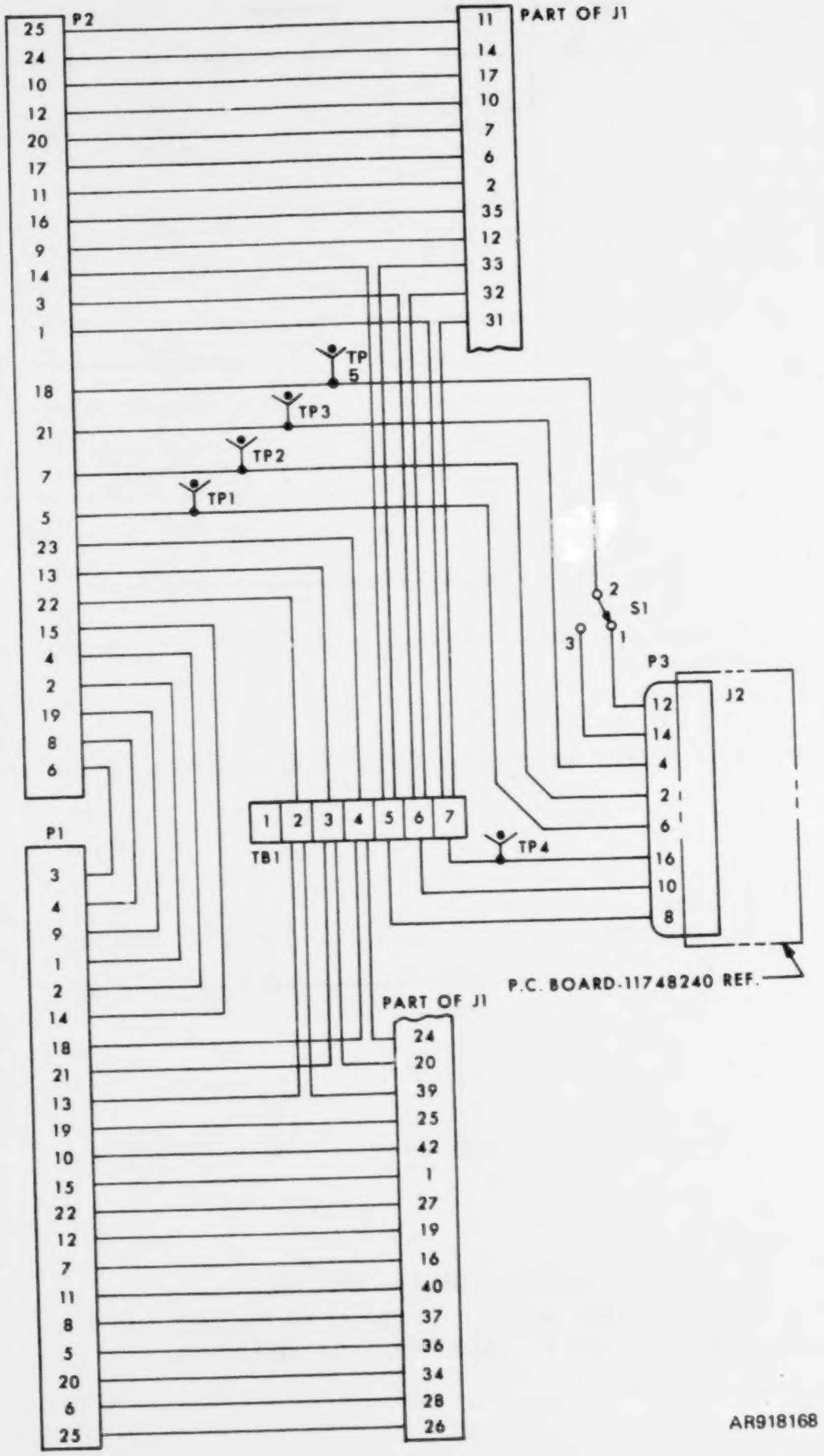
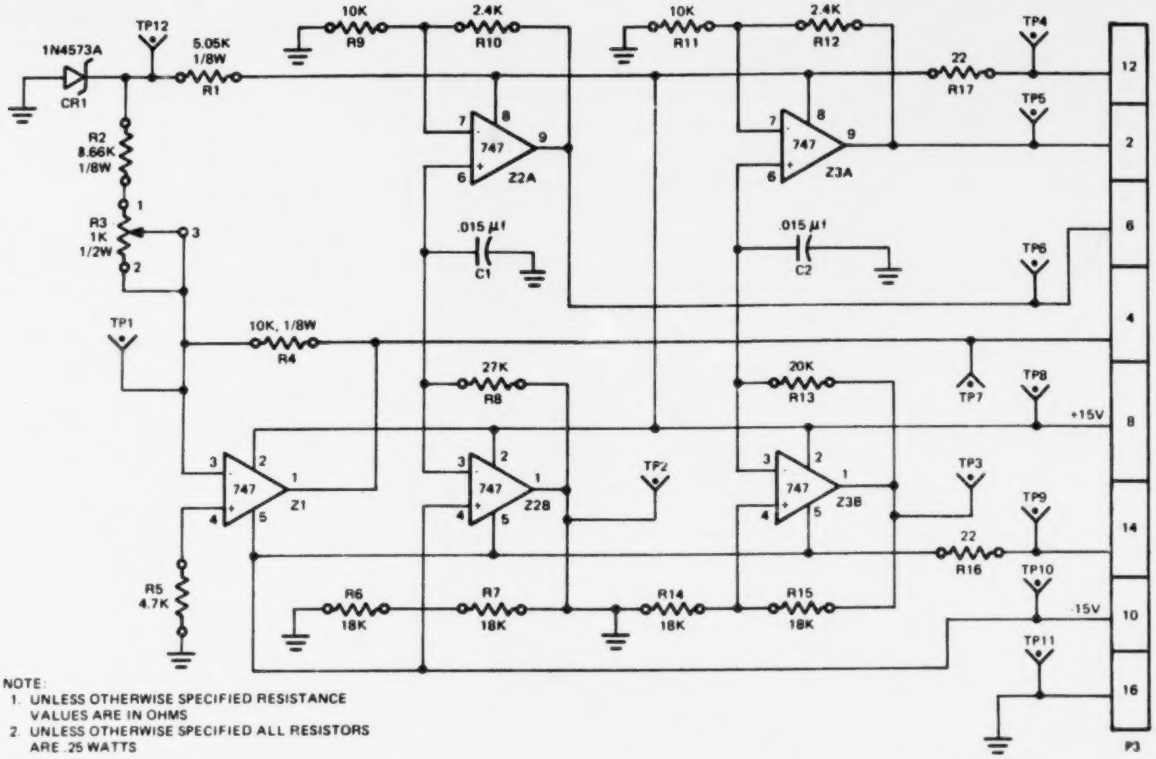

P2
25
24
10
12
20
17
11
16
9
14
3
1
18
21
7
5
23
13
22
15
4
2
19
8
6
PART OF J1
11
14
17
10
7
6
2
35
12
33
32
31
TP 5
TP3
TP2
TP1
2
S1
3
1
P3
J2
12
14
4
2
6
16
10
8
TP4
TB1
1
2
3
4
5
6
7
P.C. BOARD-11748240 REF.
P1
3
4
9
1
2
14
18
21
13
19
10
15
22
12
7
11
8
5
20
6
25
PART OF J1
24
20
39
25
42
1
27
19
16
40
37
36
34
28
26
AR918168

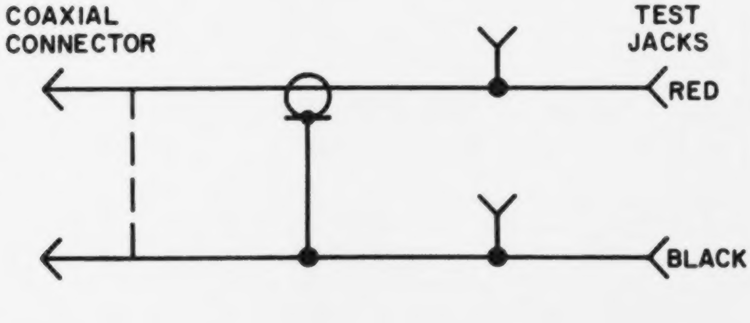
Figure 8-11. Test set adapter TS3, detailed schematic.


1N4573A
CR1
TP12
5.05K
1/8W
R1
R2
8.66K
1/8W
R3
1K
1/2W
1
2
3
TP1
10K, 1/8W
R4
R5
4.7K
10K
R9
2.4K
R10
747
Z2A
7
8
9
6
.015 µf
C1
27K
R8
747
Z1
747
Z2B
TP2
10K
R11
2.4K
R12
747
Z3A
.015 µf
C2
20K
R13
747
Z3B
TP3
TP4
TP5
TP6
TP7
TP8
TP9
TP10
TP11
22
R17
22
R16
+15V
-15V
R6
18K
R7
18K
R14
18K
R15
18K
12
2
6
4
8
14
10
16
P3

NOTE:
1. UNLESS OTHERWISE SPECIFIED RESISTANCE VALUES ARE IN OHMS
2. UNLESS OTHERWISE SPECIFIED ALL RESISTORS ARE .25 WATTS

Figure 8-12. Test set adapter TS3 circuit card, detailed schematic.

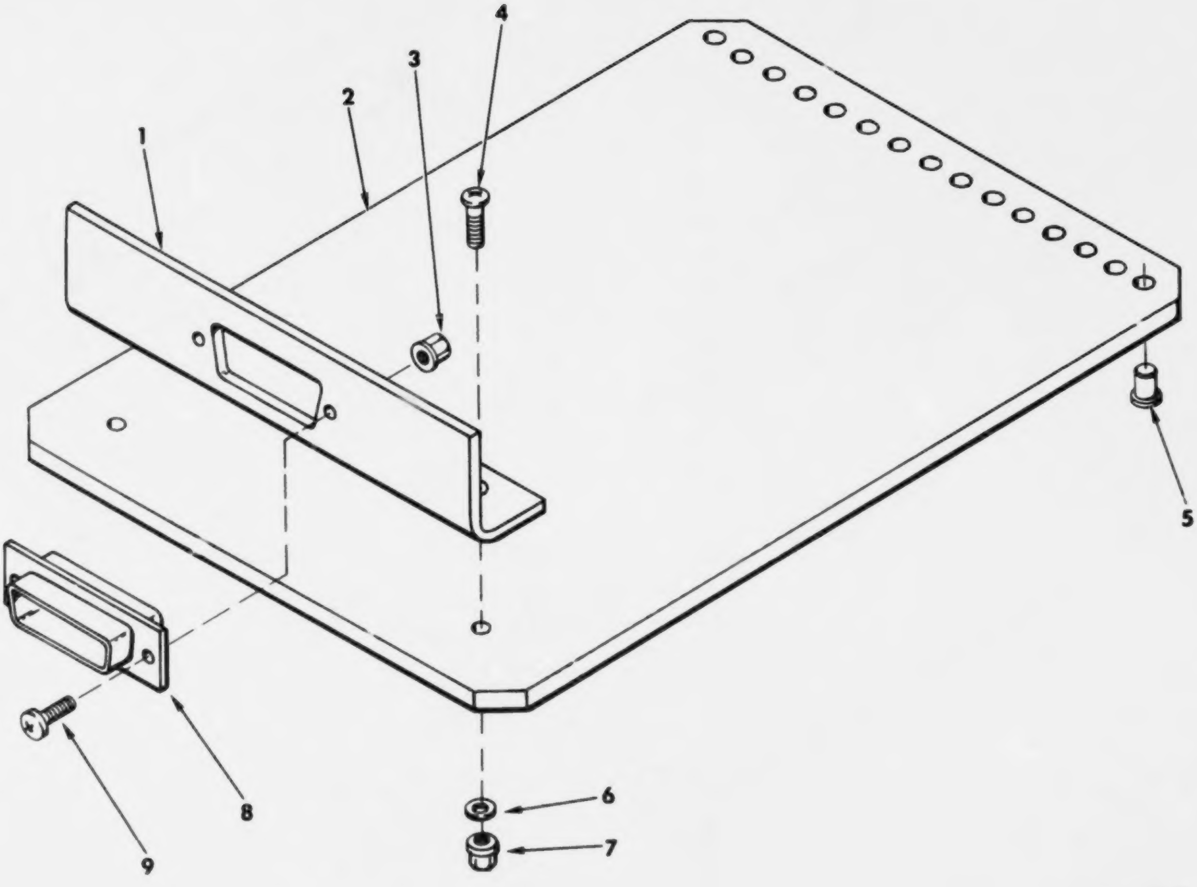
AR918169


COAXIAL
CONNECTOR
TEST
JACKS
RED
BLACK

NOTES:
1. COAXIAL CONNECTOR IS BNC PLUG.
2. A GROUND MARKER (TAB) IS PROVIDED ON THE BLACK TEST JACK SIDE OF ADAPTER.

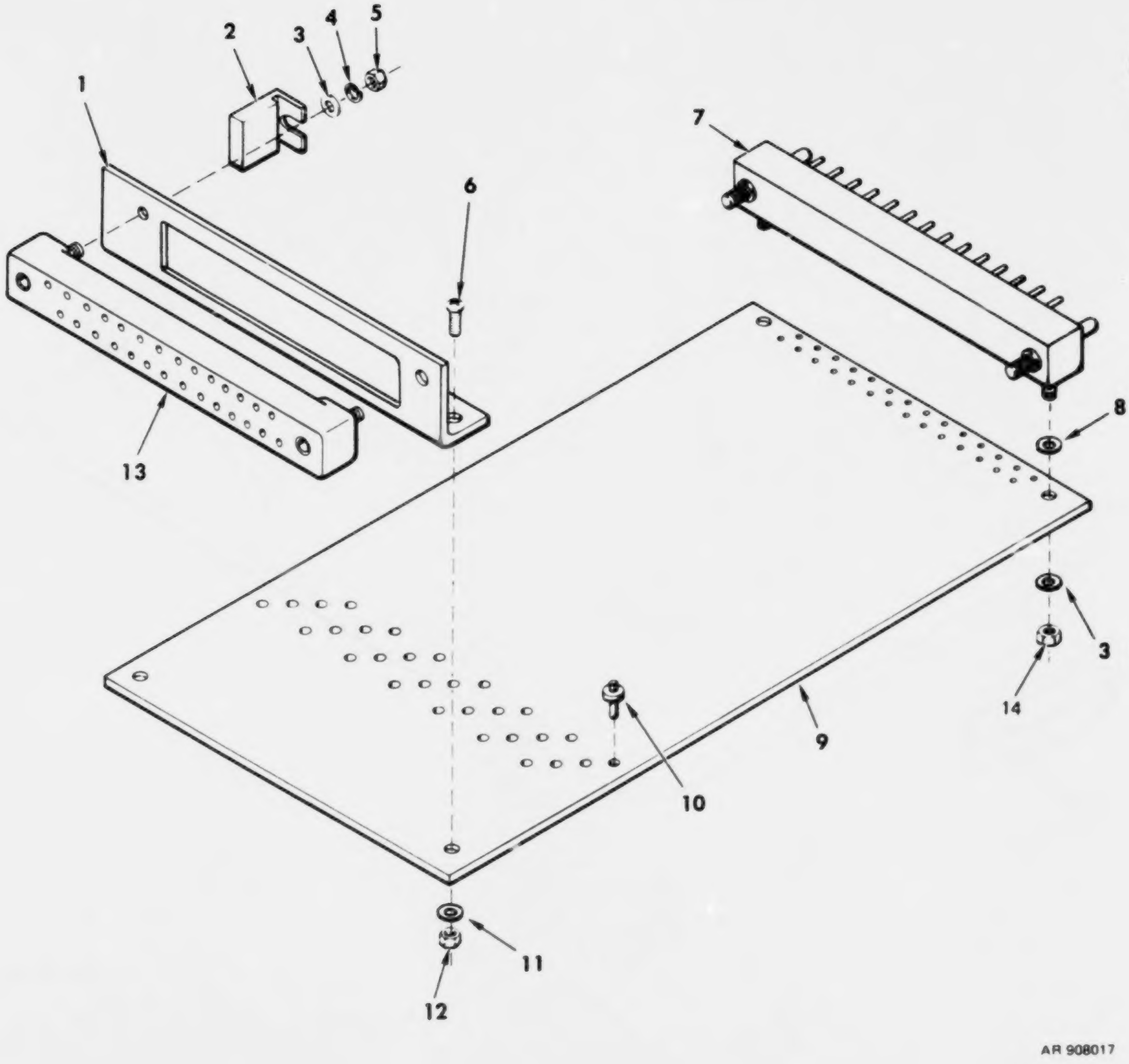
AR904831

Figure 8-13. Binding post adapter CP129, detailed schematic.


1
2
3
4
5
6
7
8
9
AR 908019

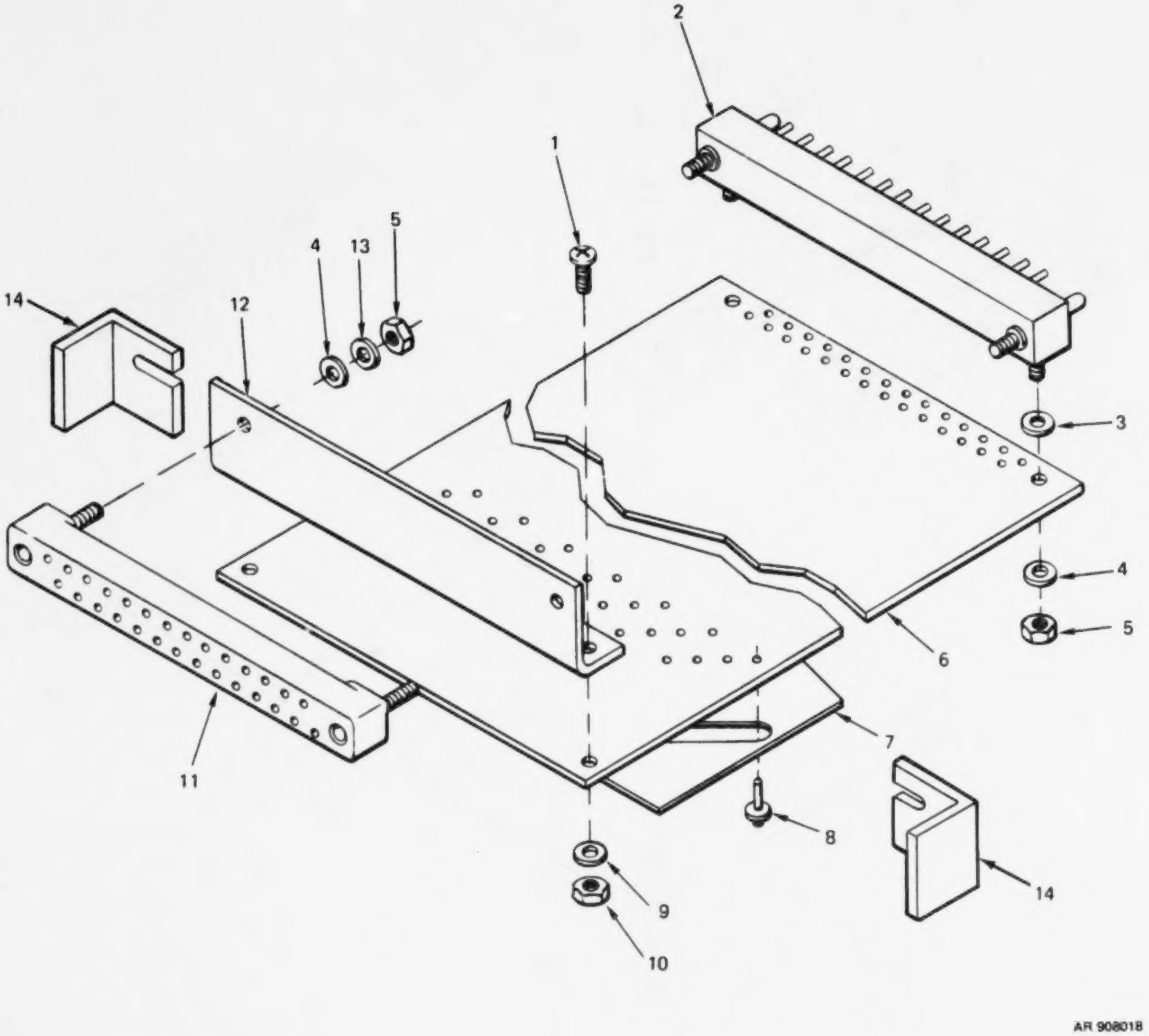
1. Bracket	4. Screw	7. Nut
2. Board	5. Jack, tip	8. Connector
3. Nut	6. Washer	9. Screw

Figure 8-14. SCG magnet and torque motor modules extender board assembly (10554283).


1
2
3
4
5
6
7
8
13
3
14
9
10
11
12
AR 908017

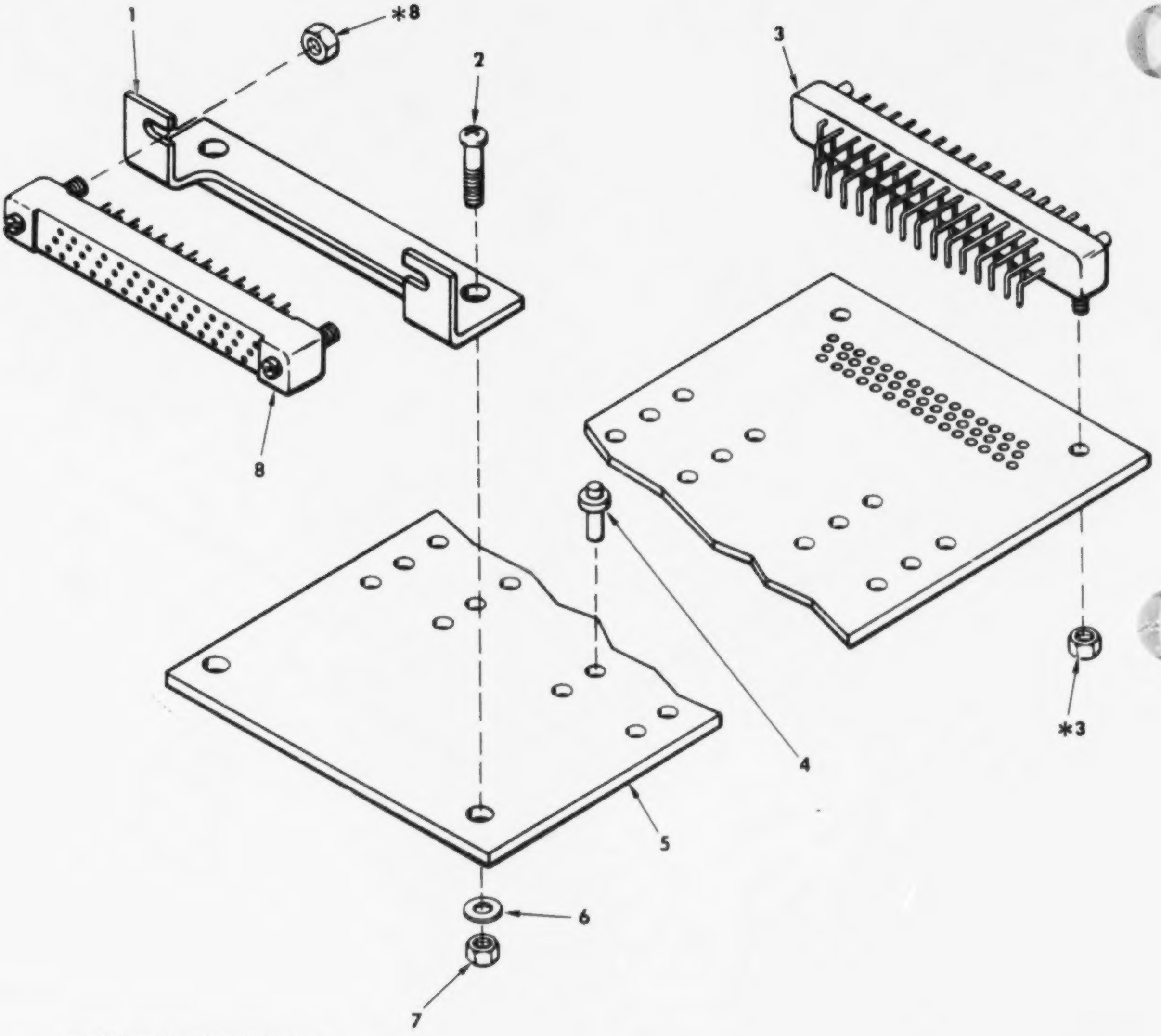
1. Bracket
2. Brace
3. Washer
4. Washer
5. Nut
6. Screw
7. Connector
8. Washer
9. Board
10. Jack, tip
11. Washer
12. Nut
13. Connector

Figure 8-15. Extender board assembly, distribution box and SCG (10554270).


2
1
5
4
13
14
12
3
4
5
6
7
11
8
14
9
10
AR 908018

1. Screw
2. Connector
3. Washer
4. Washer
5. Nut
6. Board
7. Ident plate
8. Jack, tip
9. Washer
10. Nut
11. Connector
12. Bracket
13. Washer
14. Brace

Figure 8-16. Extender board assembly, distribution box and SCG (10554271).

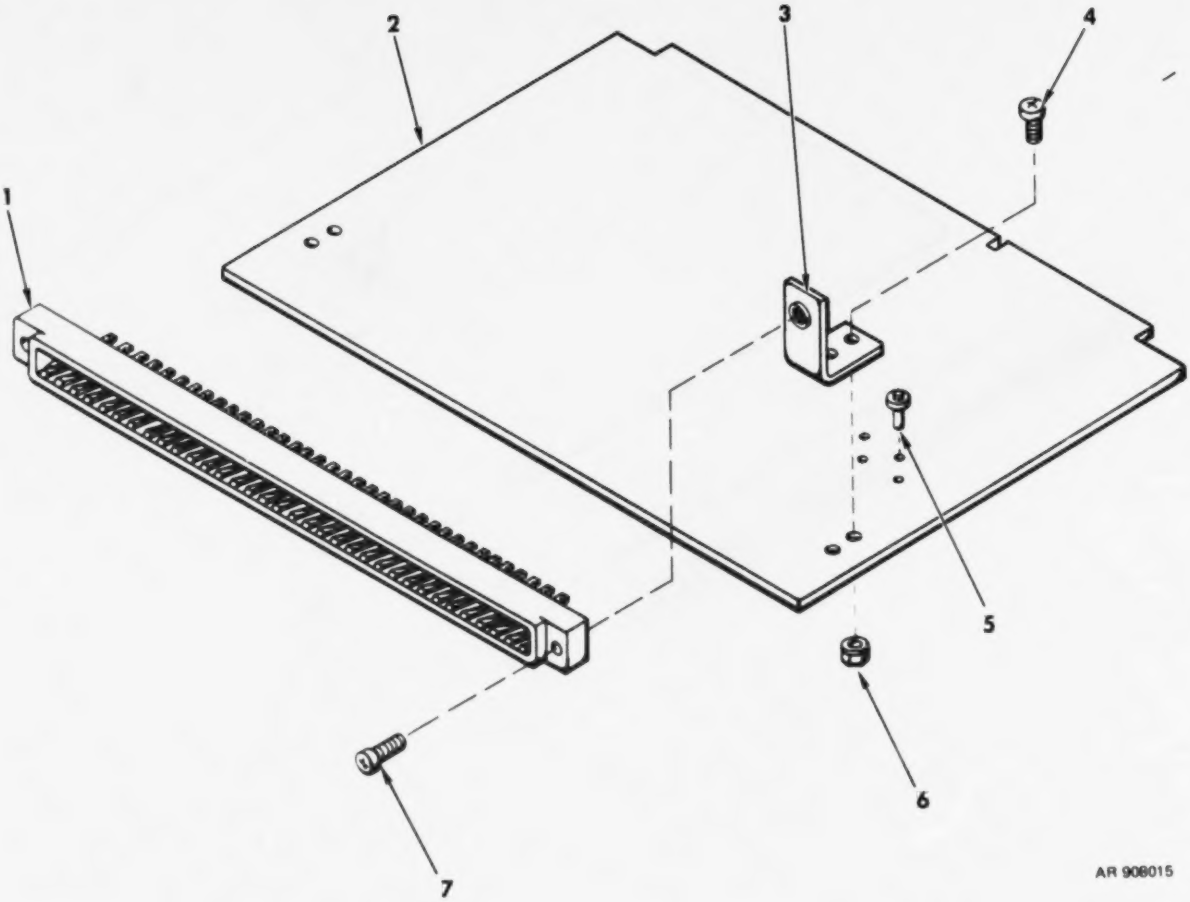


*SUPPLIED WITH IDENTICALLY NUMBERED PARTS

AR 908023

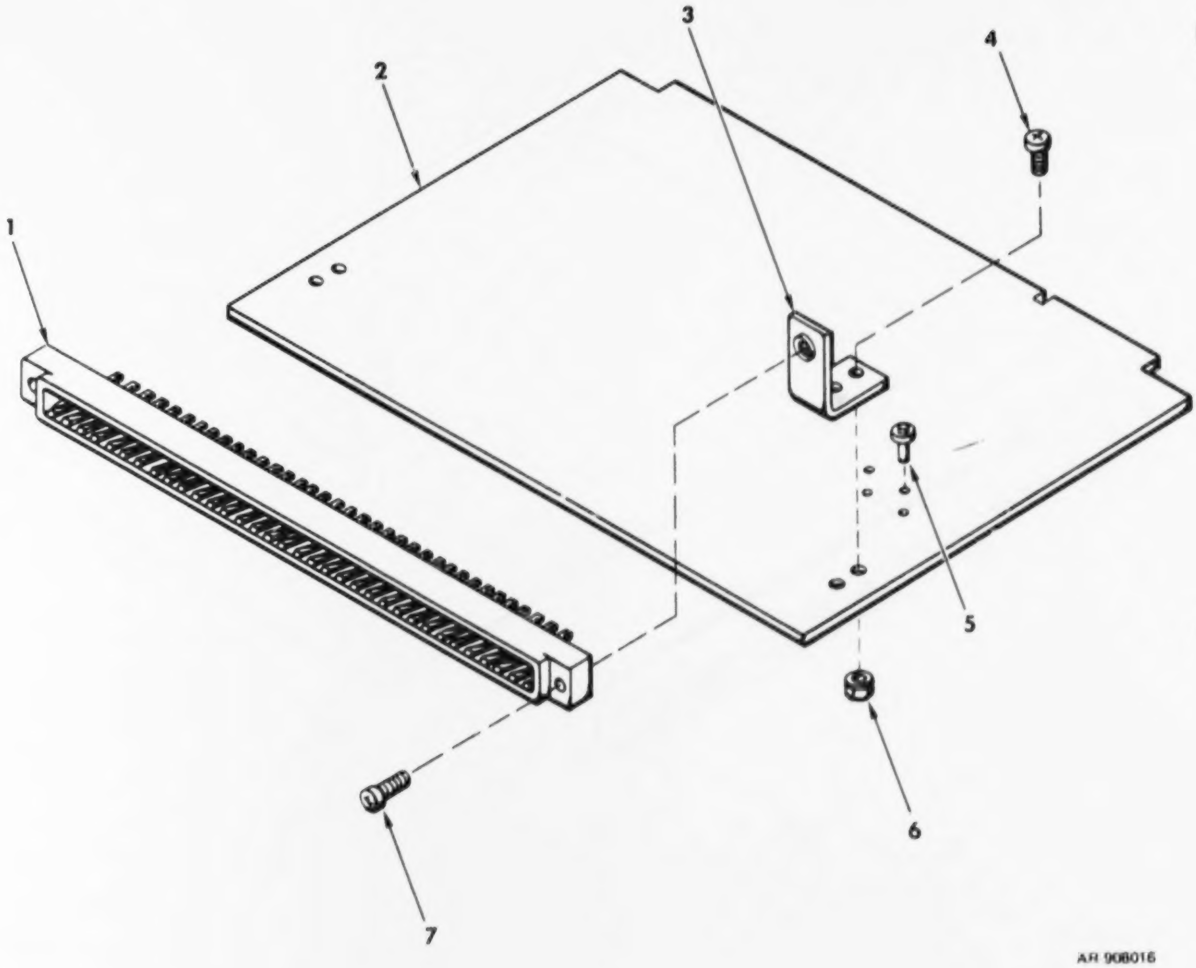
1. Bracket
2. Screw
3. Connector
4. Jack, tip
5. Board
6. Washer
7. Nut
8. Connector

Figure 8-17. Extender board assembly, AN/MWM-3 test set (8438956).


2
3
4
1
5
6
7
AR 908015

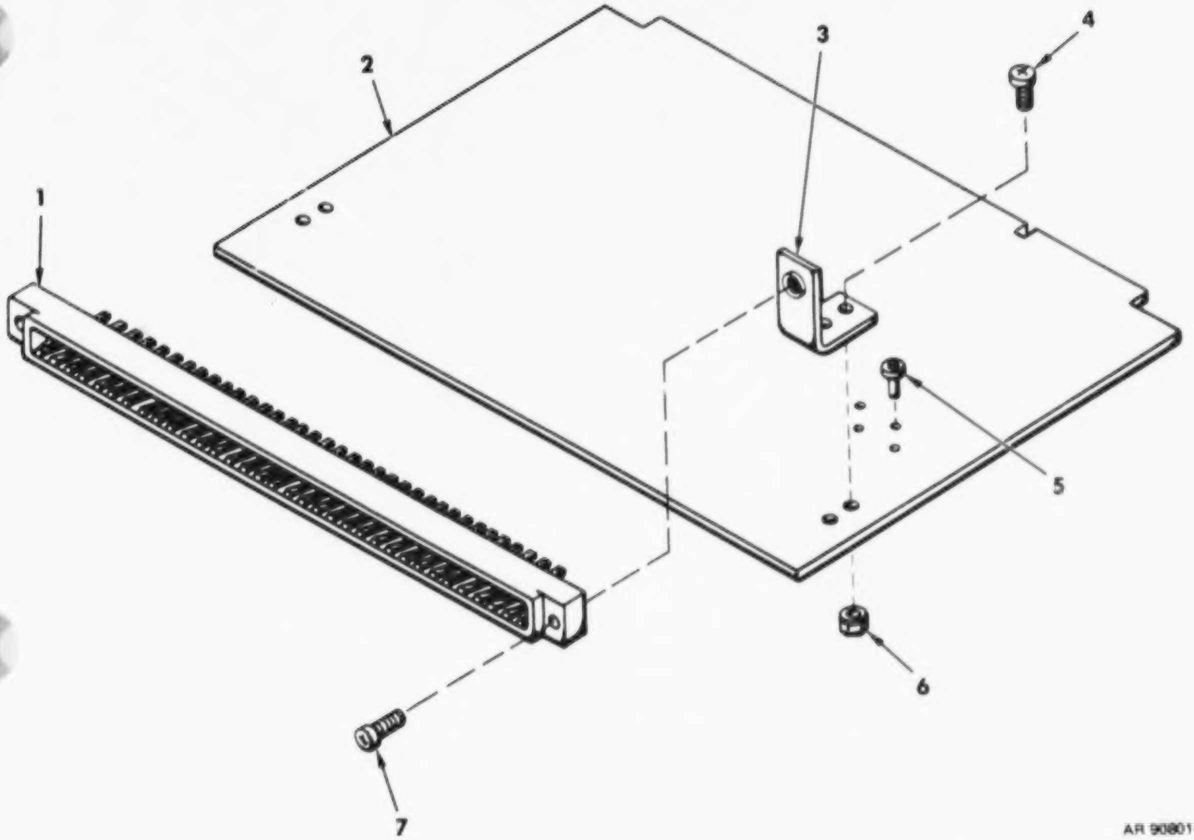
1. Connector
2. Board
3. Bracket
4. Screw
5. Jack, tip
6. Nut
7. Screw

Figure 8-18. Extender board assembly, distribution box (10554267).


1
2
3
4
5
6
7
AR 908016

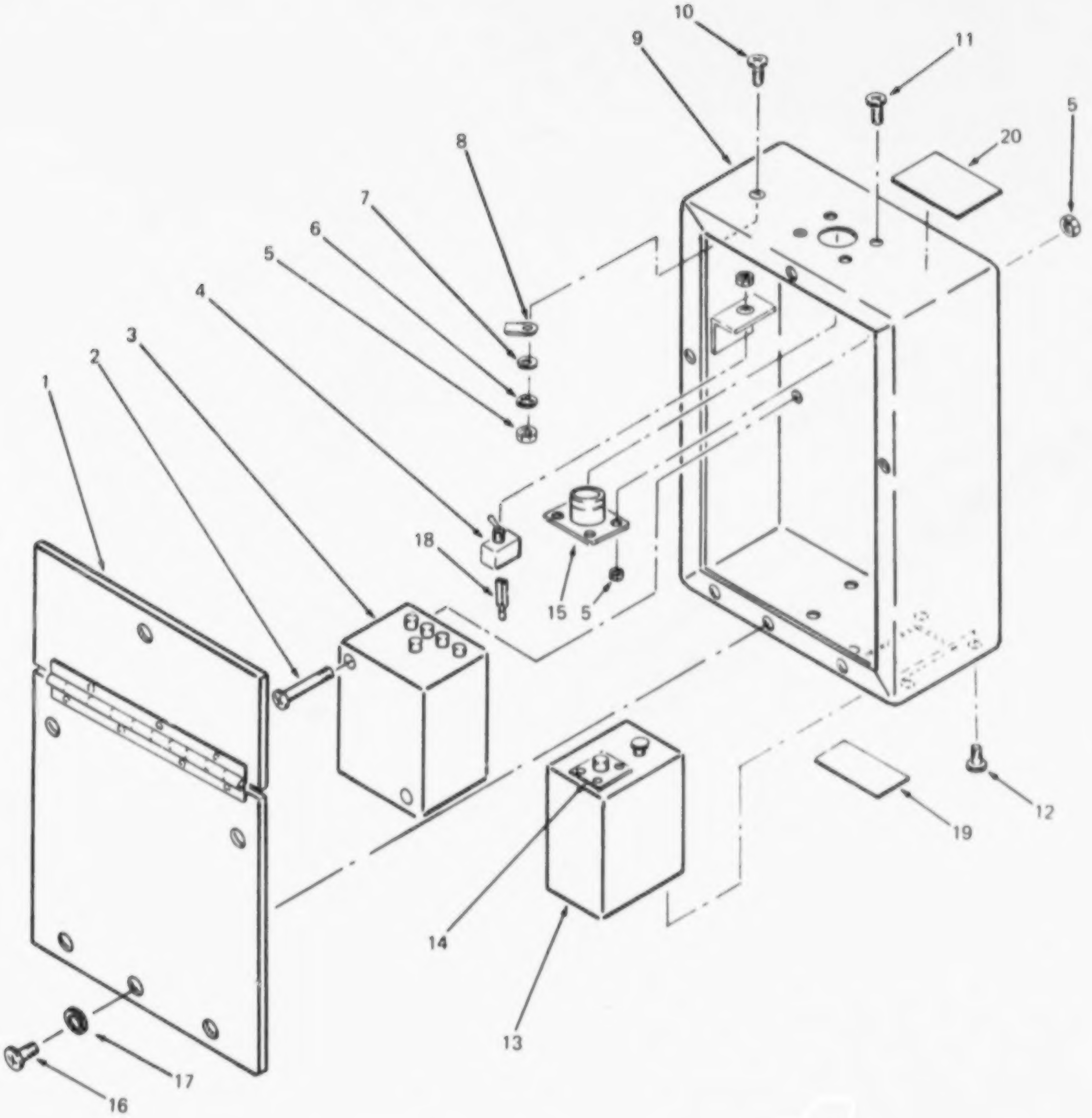
1. Connector
2. Board
3. Bracket
4. Screw
5. Jack, tip
6. Nut
7. Screw

Figure 8-19. Extender board assembly, distribution box (10554268).


1
2
3
4
5
6
7
AR 908014

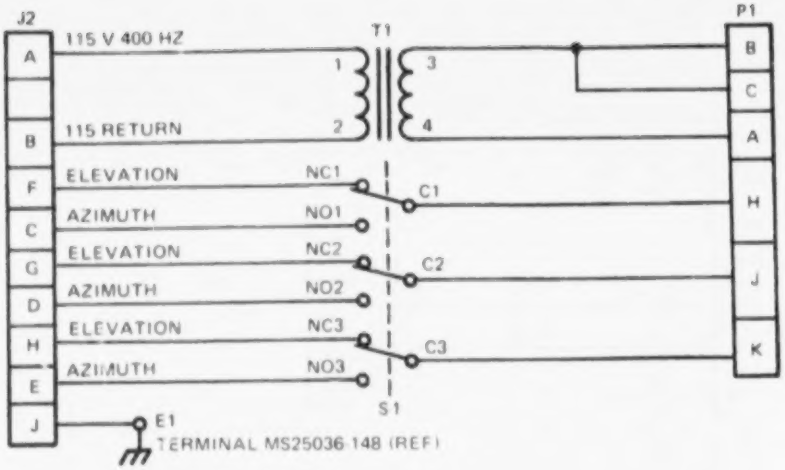
1. Connector
2. Board
3. Bracket
4. Screw
5. Jack, tip
6. Nut
7. Screw

Figure 8-20. Extender board assembly, distribution box (10554291).

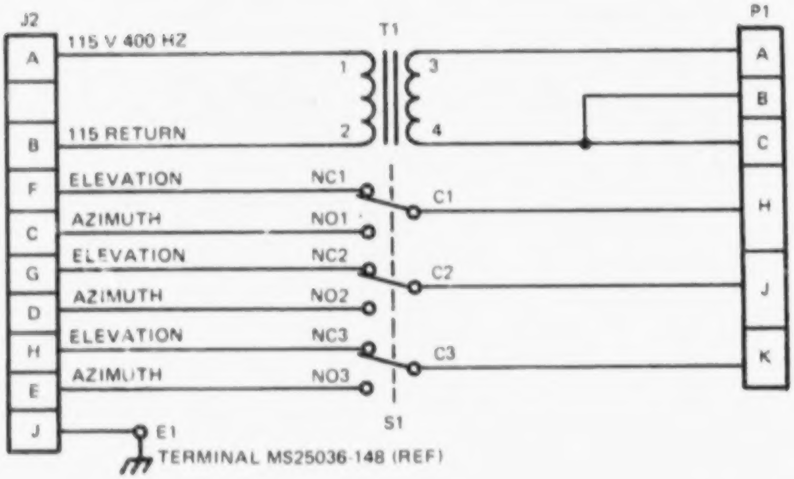

10
9
11
5
20
8
7
6
5
4
3
2
1
18
15
5
12
19
14
13
17
16

1. Cover
2. Screw
3. Transformer
4. Switch
5. Nut
6. Washer
7. Washer
8. Terminal
9. Case
10. Screw
11. Screw
12. Screw
13. Servo
14. Connector
15. Connector
16. Screw
17. Washer
18. Terminal
19. Decal
20. Plate

Figure 8-21. Auxiliary position indicator (8438963).


J2
A
B
F
C
G
D
H
E
J
115 V 400 HZ
115 RETURN
ELEVATION
AZIMUTH
ELEVATION
AZIMUTH
ELEVATION
AZIMUTH
T1
1
2
3
4
NC1
NO1
NC2
NO2
NC3
NO3
C1
C2
C3
S1
E1
TERMINAL MS25036-148 (REF)
P1
B
C
A
H
J
K

WIRING DIAGRAM
TRANSICOIL


J2
A
B
F
C
G
D
H
E
J
115 V 400 HZ
115 RETURN
ELEVATION
AZIMUTH
ELEVATION
AZIMUTH
ELEVATION
AZIMUTH
T1
1
2
3
4
NC1
NO1
NC2
NO2
NC3
NO3
C1
C2
C3
S1
E1
TERMINAL MS25036-148 (REF)
P1
A
B
C
H
J
K

WIRING DIAGRAM
SINGER-KEARFOTT

ARR81-0362

Figure 8-22. Auxiliary positon indicator, detailed schematic.

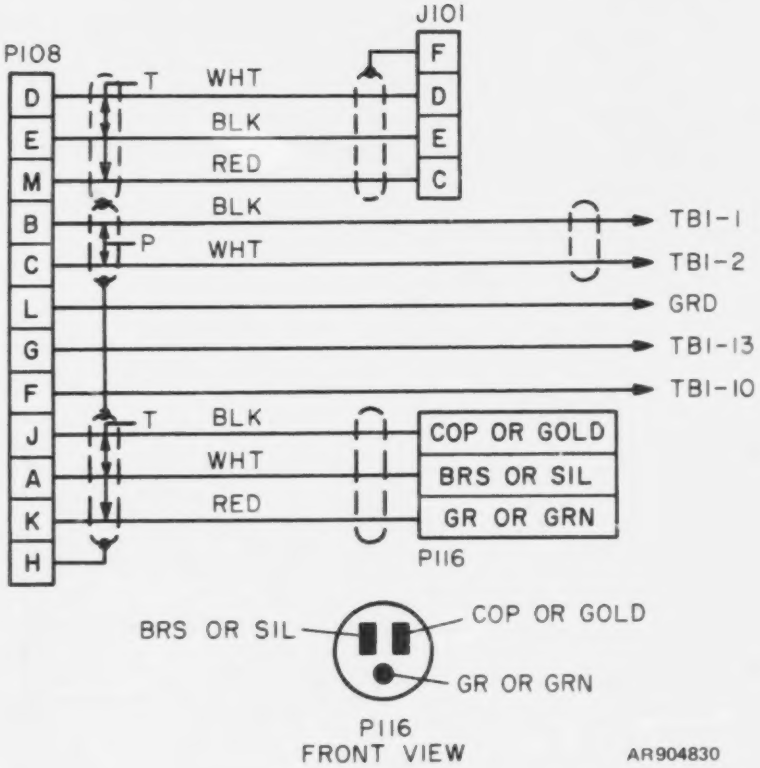

J101
P108
T
WHT
BLK
RED
BLK
P
WHT
F
D
E
C
D
E
M
B
C
L
G
F
J
A
K
H
TB1-1
TB1-2
GRD
TB1-13
TB1-10
T
BLK
WHT
RED
COP OR GOLD
BRS OR SIL
GR OR GRN
P116
BRS OR SIL
COP OR GOLD
GR OR GRN
P116
FRONT VIEW
AR904830

Figure 8-23. Internal cable assembly W120 (10554147) wiring diagram.

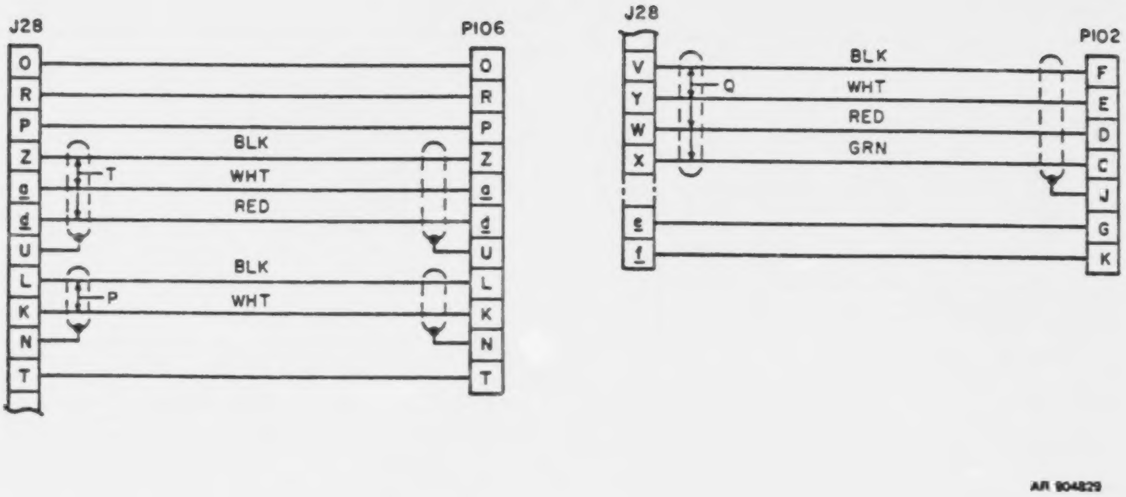
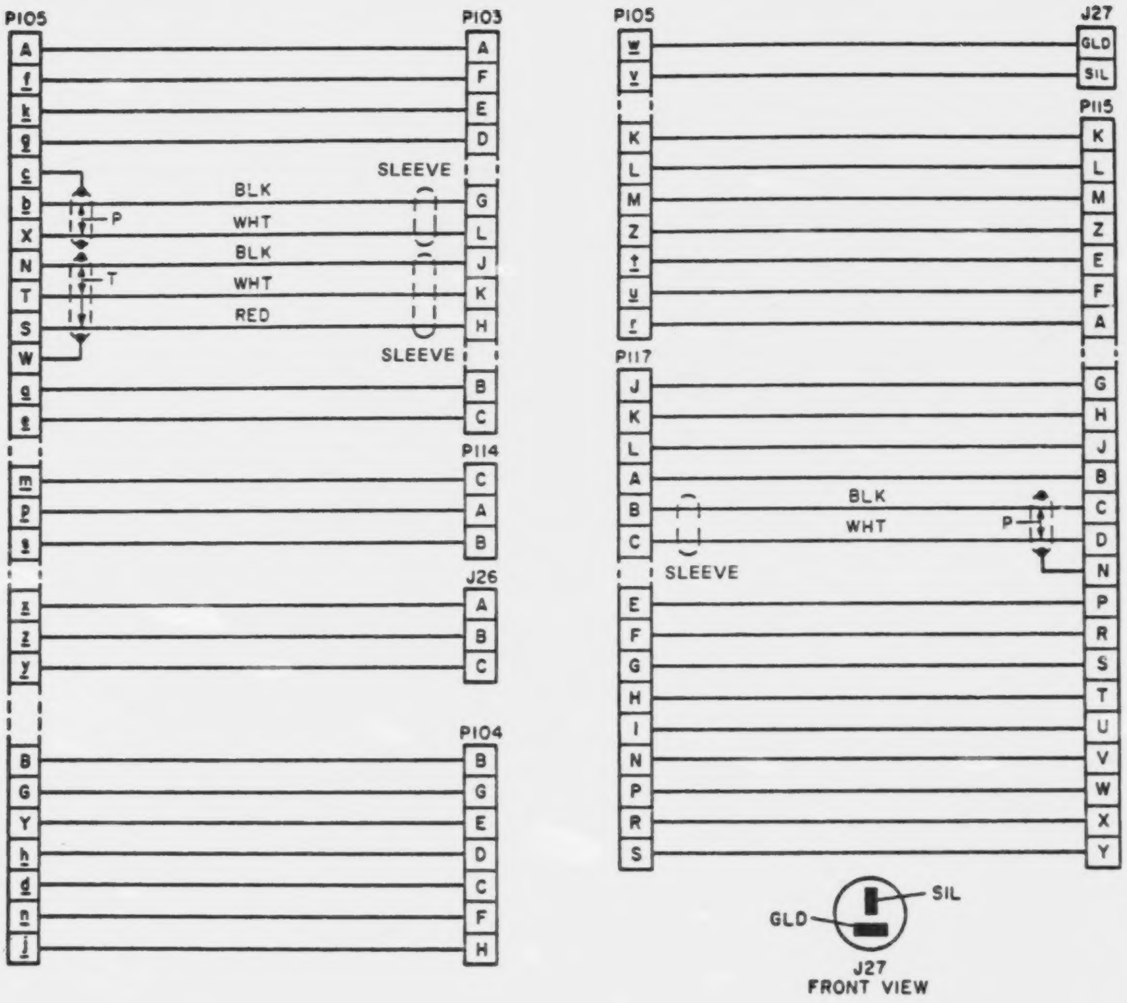

J28
P106
O
R
P
Z
a
d
U
L
K
N
T
BLK
WHT
RED
T
BLK
WHT
P
J28
P102
V
Y
W
X
e
f
BLK
WHT
RED
GRN
Q
F
E
D
C
J
G
K
AR 904829

Figure 8-24. Internal cable assembly W121 (10554148) wiring diagram.


P105
A
f
k
g
c
b
X
N
T
S
W
a
e
m
p
s
x
z
y
B
G
Y
h
d
n
j
P
T
BLK
WHT
BLK
WHT
RED
SLEEVE
SLEEVE
P103
A
F
E
D
G
L
J
K
H
B
C
P114
C
A
B
J26
A
B
C
P104
B
G
E
D
C
F
H
P105
w
v
K
L
M
Z
t
u
r
P117
J
K
L
A
B
C
E
F
G
H
I
N
P
R
S
SLEEVE
BLK
WHT
P
J27
GLD
SIL
P115
K
L
M
Z
E
F
A
G
H
J
B
C
D
N
P
R
S
T
U
V
W
X
Y
SIL
GLD
J27
FRONT VIEW

AR 904828

Figure 8-25. Internal cable assembly W122 (10554168) wiring diagram.

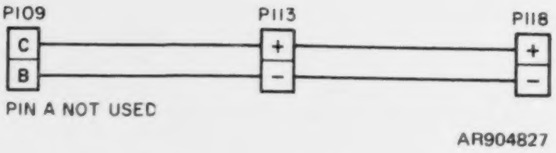

P109
C
B
PIN A NOT USED
P113
+
−
P118
+
−
AR904827

Figure 8-26. Internal cable assembly W123 (10554144) wiring diagram.

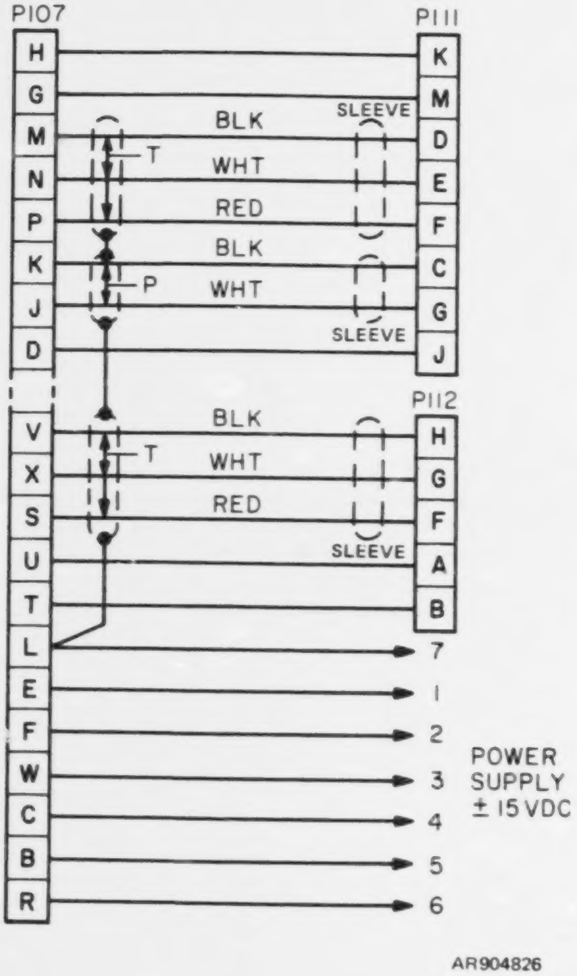

P107
H
G
M
N
P
K
J
D
V
X
S
U
T
L
E
F
W
C
B
R
P111
K
M
D
E
F
C
G
J
SLEEVE
BLK
WHT
RED
T
P
SLEEVE
P112
H
G
F
A
B
BLK
WHT
RED
T
SLEEVE
7
1
2
3
4
5
6
POWER SUPPLY ± 15 VDC
AR904826

Figure 8-27. Internal cable assembly W124 (10554158) wiring diagram.

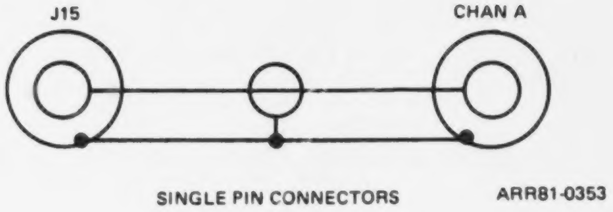

J15
CHAN A
SINGLE PIN CONNECTORS
ARR81-0353

Figure 8-28. Internal cable assembly W152 (11825877-1) wiring diagram.

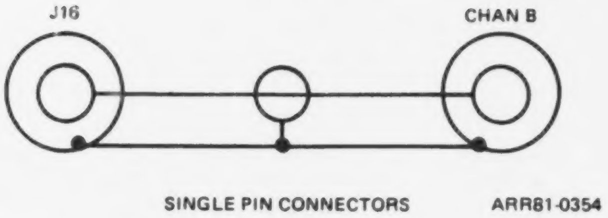

J16
CHAN B
SINGLE PIN CONNECTORS
ARR81-0354

Figure 8-29. Internal cable assembly W153 (11825877-2) wiring diagram.

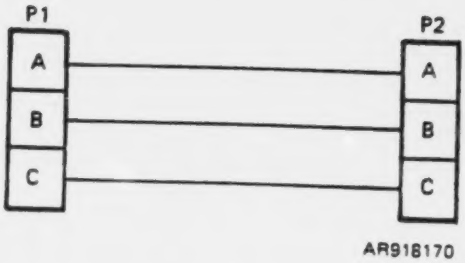

P1
P2
A
B
C
A
B
C
AR918170

Figure 8-30. Internal cable assembly W201 (11747114-1) wiring diagram.

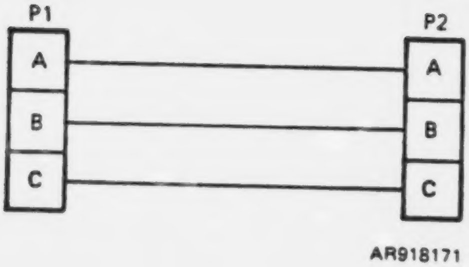
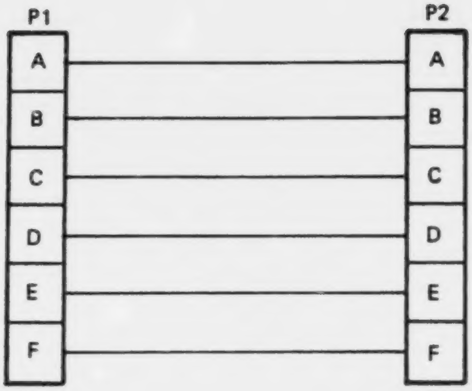
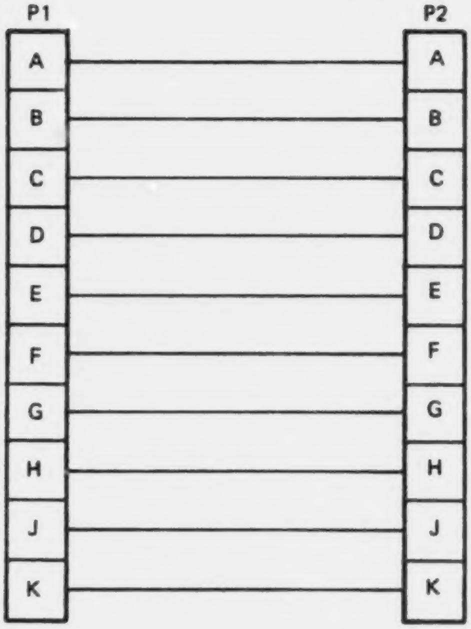

P1
P2
A
B
C
A
B
C
AR918171

Figure 8-31. Internal cable assembly W202 (11747114-2) wiring diagram.


P1
P2
A
B
C
D
E
F
A
B
C
D
E
F

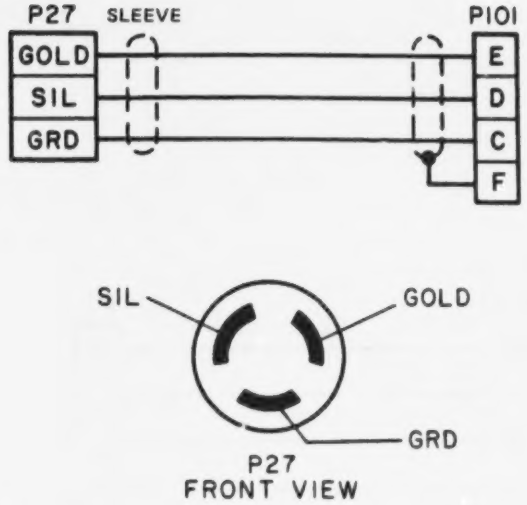
AR918172

Figure 8-32. Internal cable assembly W203 (11747114-3) wiring diagram.


P1
P2
A
B
C
D
E
F
G
H
J
K
A
B
C
D
E
F
G
H
J
K

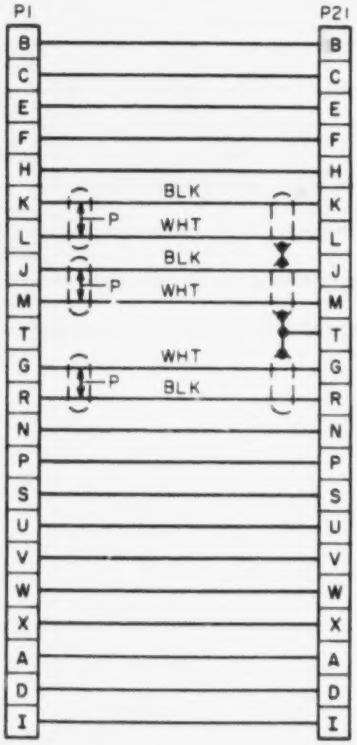
AR918173

Figure 8-33. Internal cable assembly W204 (11747114-4) wiring diagram.


P27
SLEEVE
P101
GOLD
SIL
GRD
E
D
C
F
SIL
GOLD
GRD
P27
FRONT VIEW

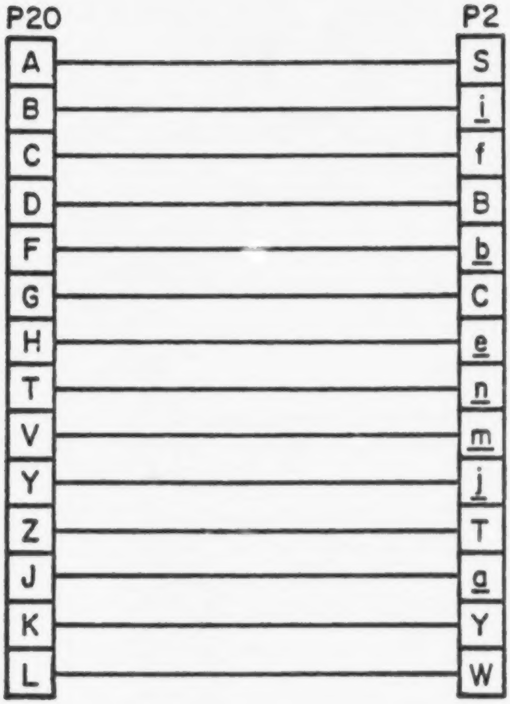
AR904825

Figure 8-34. External shelter power cable assembly W125 (10554160) wiring diagram.


P1
P21
B
C
E
F
H
K
L
J
M
T
G
R
N
P
S
U
V
W
X
A
D
I
BLK
WHT
BLK
WHT
WHT
BLK
P
P
P

AR904824

Figure 8-35. Test cable W101 (10554021) wiring diagram.


P20
P2
A
S
B
i
C
f
D
B
F
b
G
C
H
e
T
n
V
m
Y
j
Z
T
J
a
K
Y
L
W

AR 905194

Figure 8-36. Test cable W102 (12000051) wiring diagram.

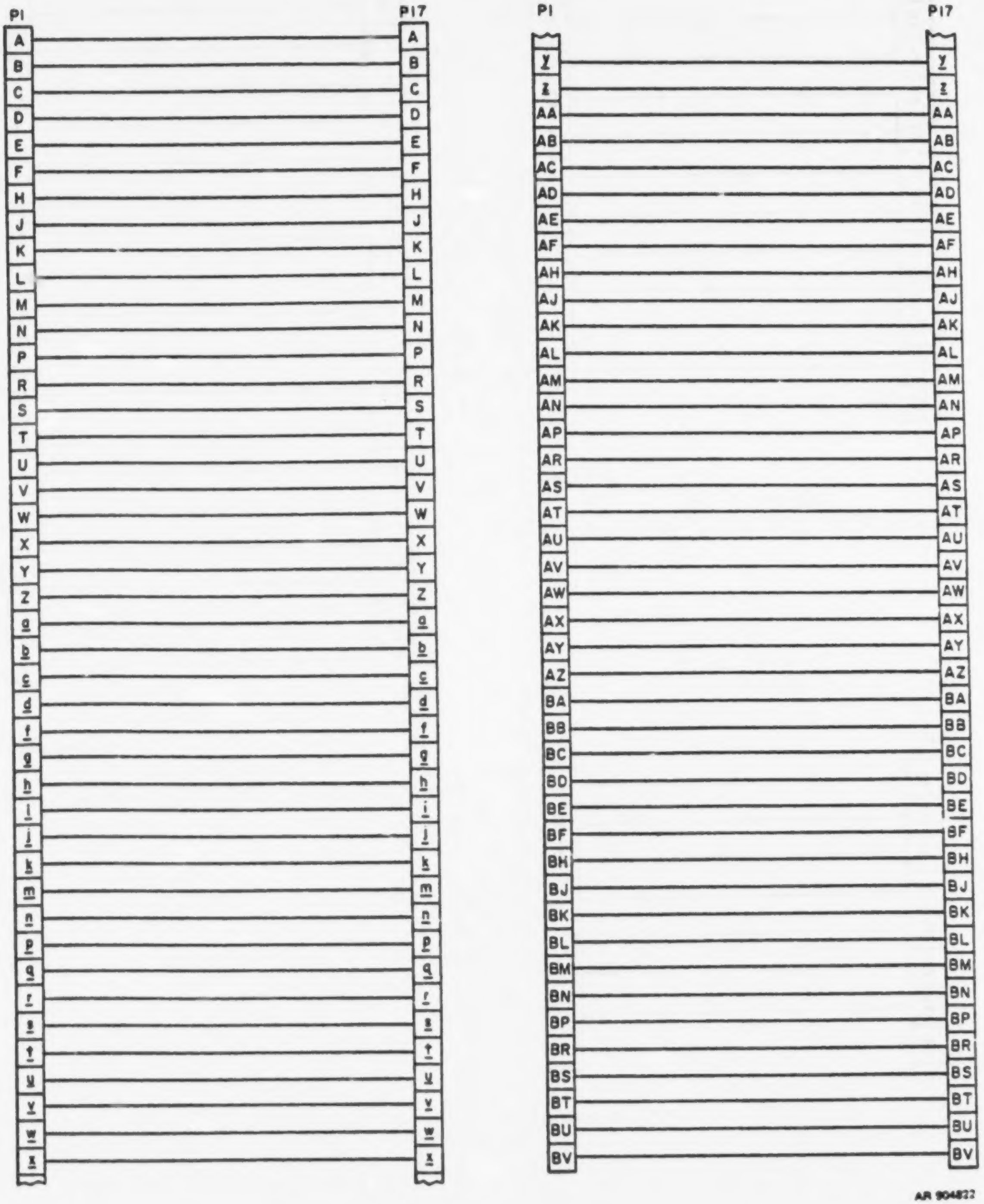
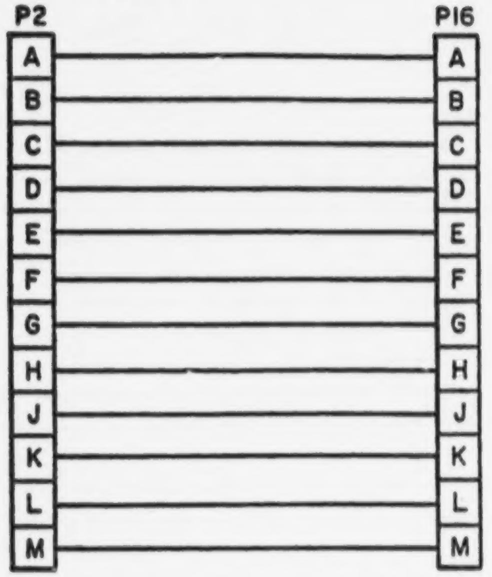
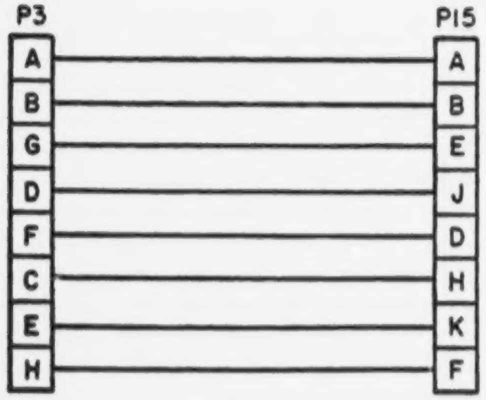

P1
P17
A
B
C
D
E
F
H
J
K
L
M
N
P
R
S
T
U
V
W
X
Y
Z
a
b
c
d
f
g
h
i
j
k
m
n
p
q
r
s
t
u
v
w
x
P1
P17
y
z
AA
AB
AC
AD
AE
AF
AH
AJ
AK
AL
AM
AN
AP
AR
AS
AT
AU
AV
AW
AX
AY
AZ
BA
BB
BC
BD
BE
BF
BH
BJ
BK
BL
BM
BN
BP
BR
BS
BT
BU
BV
AR 904822

Figure 8-37. Test cable W103 (10554023) wiring diagram.


P2
P16
A A
B B
C C
D D
E E
F F
G G
H H
J J
K K
L L
M M

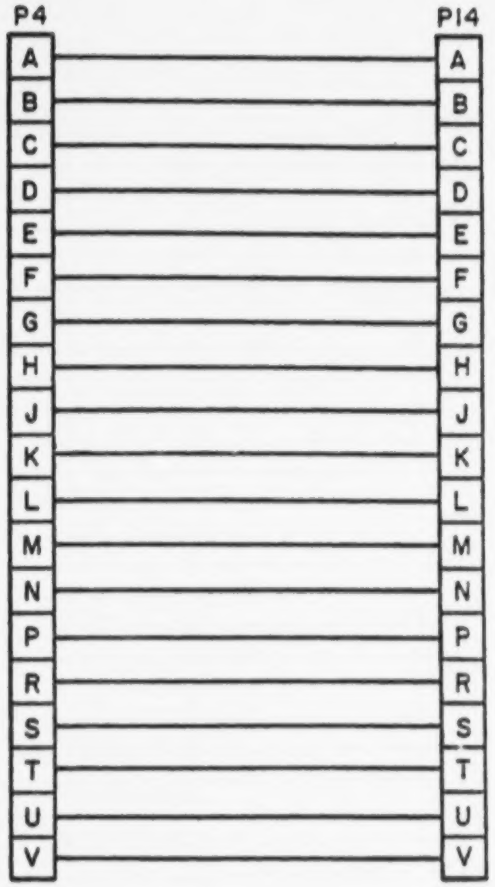
AR 904821

Figure 8-38.
Test cable W104 (10554024) wiring diagram.


P3
P15
A A
B B
G E
D J
F D
C H
E K
H F

AR 904820

Figure 8-39.
Test cable W105 (10554025) wiring diagram.


P4
P14
A A
B B
C C
D D
E E
F F
G G
H H
J J
K K
L L
M M
N N
P P
R R
S S
T T
U U
V V

AR 904819

Figure 8-40.
Test cable W106 (10554026) wiring diagram.

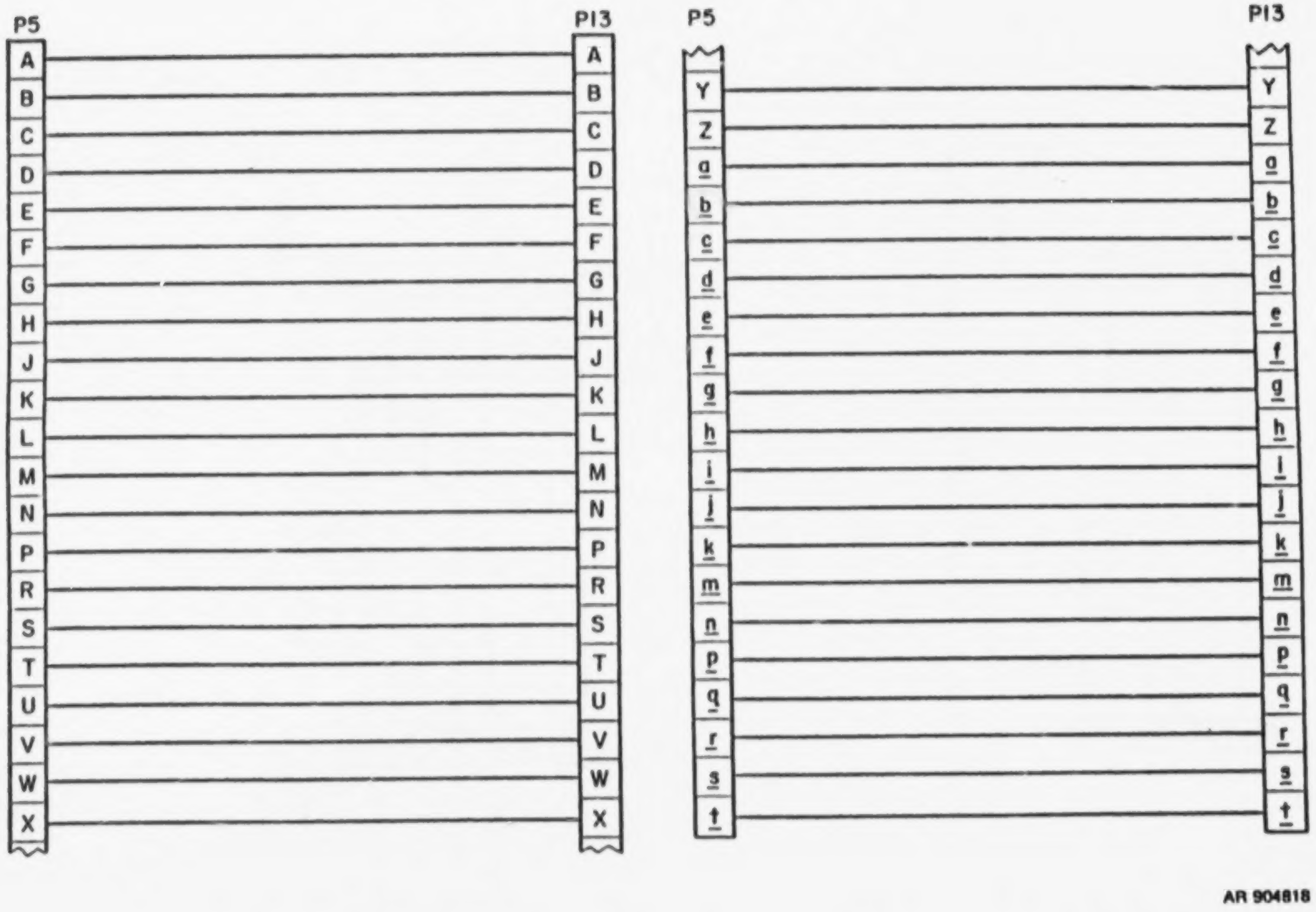

P5
A
B
C
D
E
F
G
H
J
K
L
M
N
P
R
S
T
U
V
W
X
P13
A
B
C
D
E
F
G
H
J
K
L
M
N
P
R
S
T
U
V
W
X
P5
Y
Z
a
b
c
d
e
f
g
h
i
j
k
m
n
p
q
r
s
t
P13
Y
Z
a
b
c
d
e
f
g
h
i
j
k
m
n
p
q
r
s
t
AR 904818

Figure 8-41. Test cable W107 (10554027) wiring diagram.

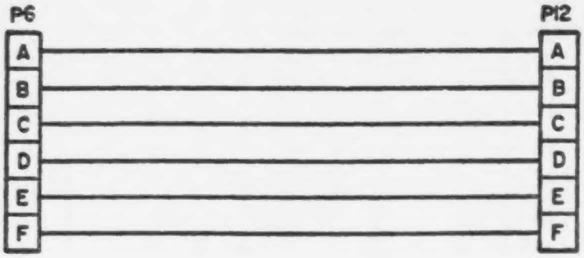

P6
P12
A
B
C
D
E
F
A
B
C
D
E
F
AR 904817

Figure 8-42. Test cable W108 (10554028) wiring diagram.

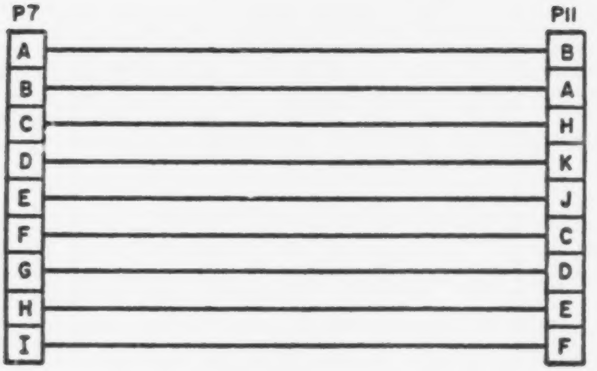

P7
P11
A
B
C
D
E
F
G
H
I
B
A
H
K
J
C
D
E
F
AR 904816

Figure 8-43. Test cable W109 (10554029) wiring diagram.

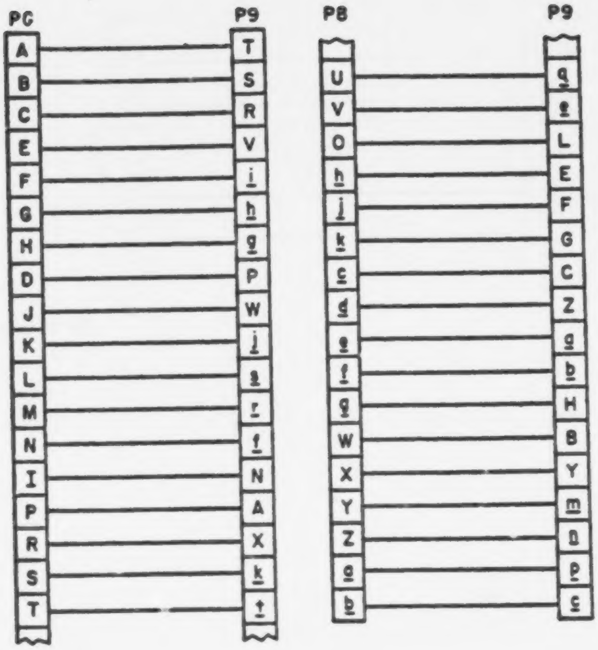

P8
P9
A T
B S
C R
E V
F i
G h
H g
D P
J W
K j
L s
M r
N f
I N
P A
R X
S k
T t
P8
P9
U q
V e
O L
h E
j F
k G
c C
d Z
e a
f b
g H
W B
X Y
Y m
Z n
a p
b c
AR 904815

Figure 8-44. Test cable W110 (10554030) wiring diagram.

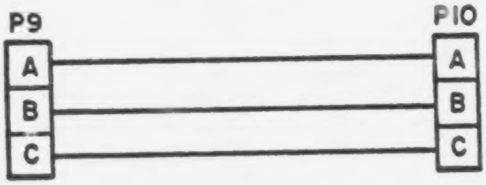
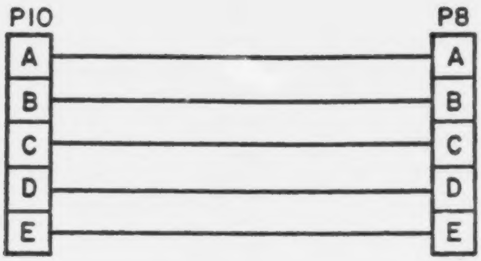
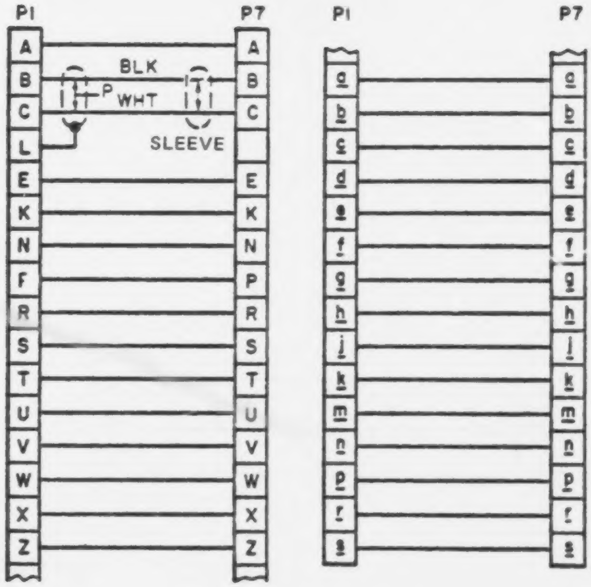

P9
P10
A A
B B
C C
AR 905231

Figure 8-45. Test cable W111 (10554031) wiring diagram.


P10
P8
A
B
C
D
E
A
B
C
D
E

AR 904814

Figure 8-46. Test cable W112 (10554032) wiring diagram.


P1
P7
P1
P7
A
B
C
L
E
K
N
F
R
S
T
U
V
W
X
Z
BLK
P
WHT
SLEEVE
A
B
C
E
K
N
P
R
S
T
U
V
W
X
Z
a
b
c
d
e
f
g
h
j
k
m
n
p
r
s
a
b
c
d
e
f
g
h
j
k
m
n
p
r
s

AR 904813

Figure 8-47. Test cable W113 (10554033) wiring diagram.

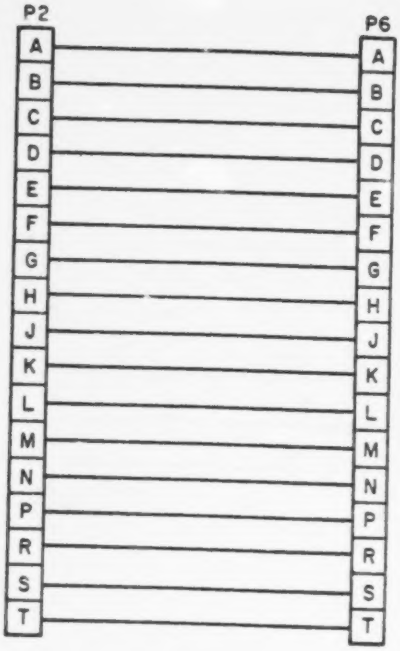

P2
P6
A
B
C
D
E
F
G
H
J
K
L
M
N
P
R
S
T
AR 904812

Figure 8-48. Test cable W114 (10554034) wiring diagram.

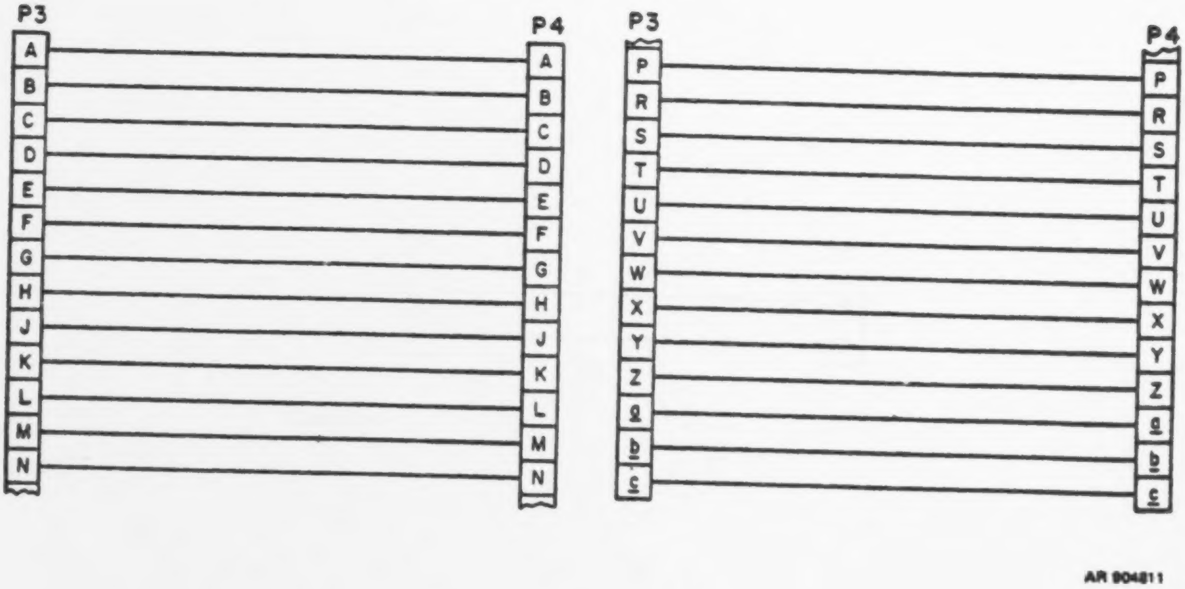
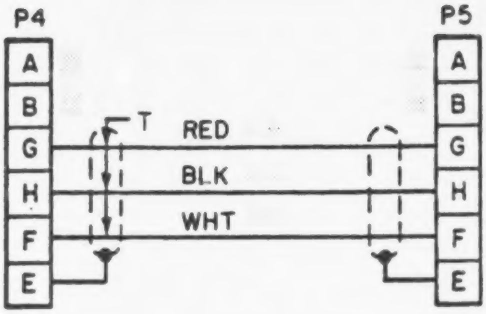
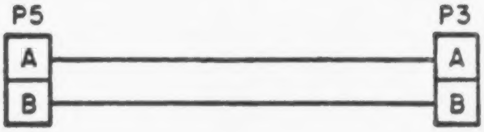

P3
P4
A
B
C
D
E
F
G
H
J
K
L
M
N
P3
P4
P
R
S
T
U
V
W
X
Y
Z
a
b
c
AR 904811

Figure 8-49. Test cable W115 (10554045) wiring diagram.


P4
A
B
G
H
F
E
T
RED
BLK
WHT
P5
A
B
G
H
F
E

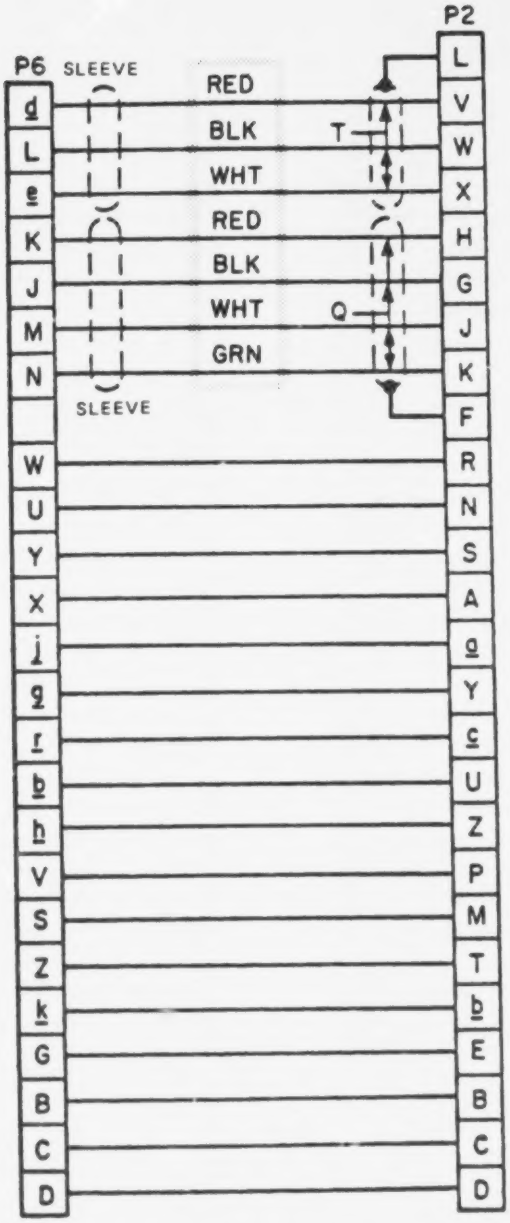
ARR82-28633

Figure 8-50. Test cable W116 (10554046) wiring diagram.



AR 904809

Figure 8-51. Test cable W117 (10554047) wiring diagram.


P2
P6
SLEEVE
RED
BLK
WHT
RED
BLK
WHT
GRN
SLEEVE
T
Q
d
L
e
K
J
M
N
W
U
Y
X
j
g
r
b
h
V
S
Z
k
G
B
C
D
L
V
W
X
H
G
J
K
F
R
N
S
A
a
Y
c
U
Z
P
M
T
b
E
B
C
D

ARR82-28634

Figure 8-52. Test cable W118 (10554048) wiring diagram.

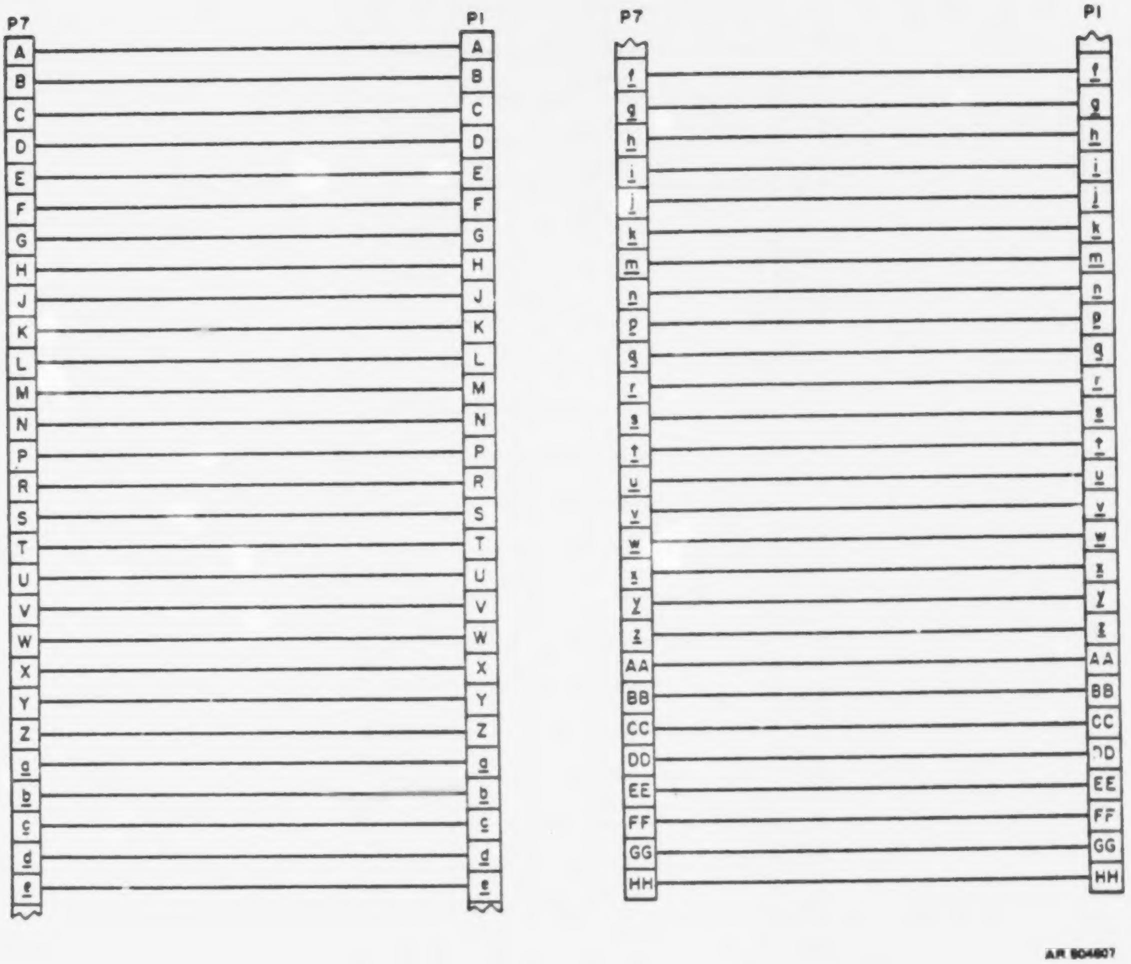
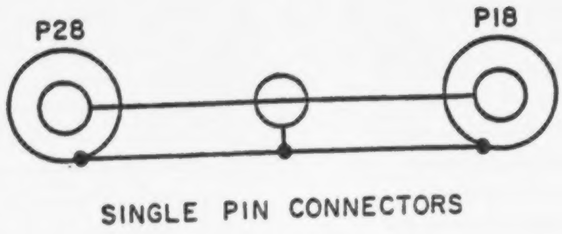
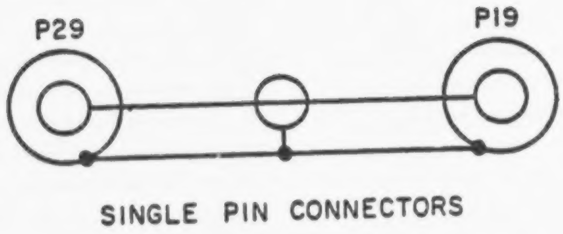

P7
P1
A
B
C
D
E
F
G
H
J
K
L
M
N
P
R
S
T
U
V
W
X
Y
Z
a
b
c
d
e
P7
P1
f
g
h
i
j
k
m
n
p
q
r
s
t
u
v
w
x
y
z
AA
BB
CC
DD
EE
FF
GG
HH
AR 904807

Figure 8-53. Test cable W119 (10554049) wiring diagram.


P28
P18
SINGLE PIN CONNECTORS

AR 904806

Figure 8-54. Test cable W126 (10554193) wiring diagram.


P29
P19
SINGLE PIN CONNECTORS

AR 904696

Figure 8-55. Test cable W127 (10554202) wiring diagram.

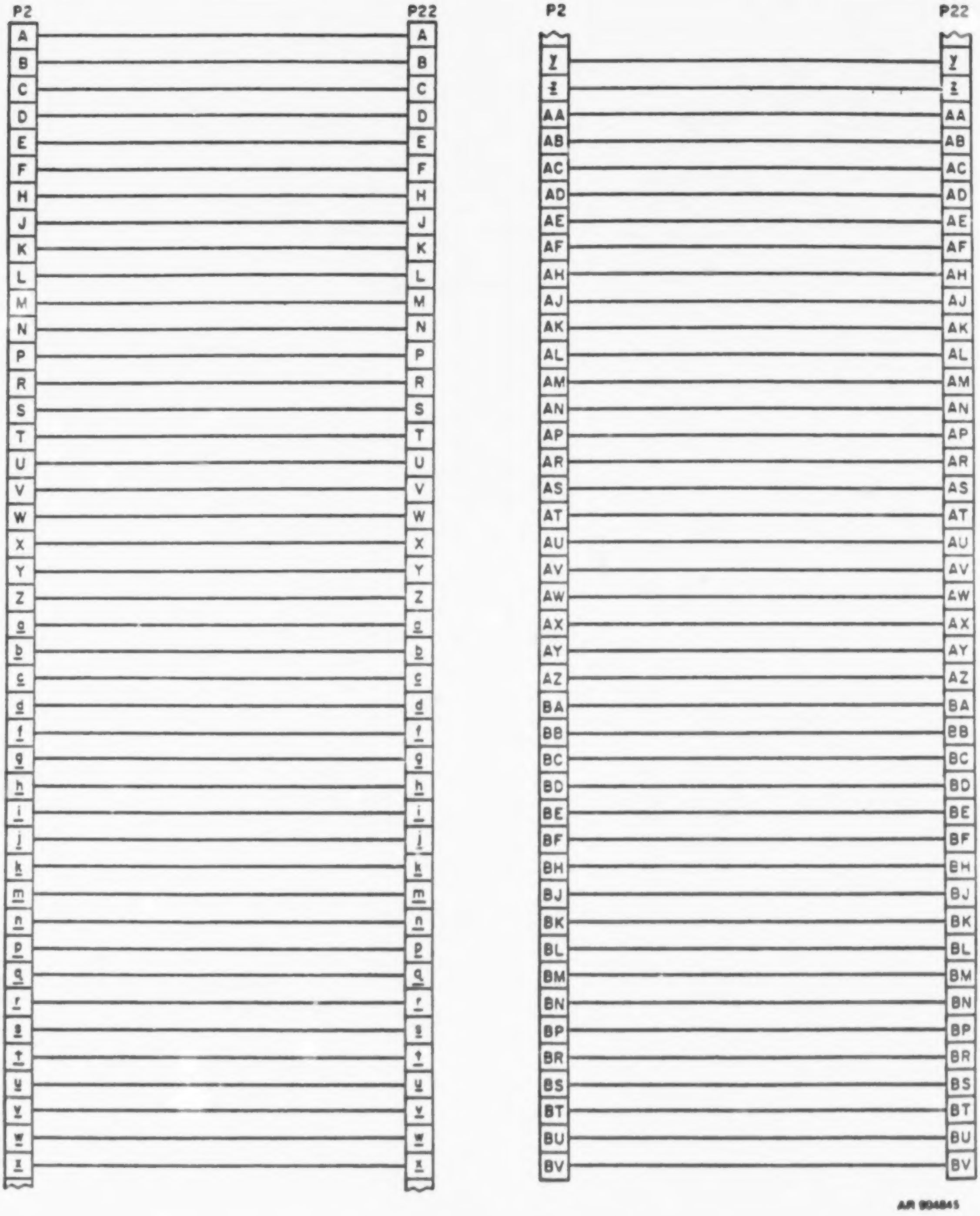

P2
P22
A
B
C
D
E
F
H
J
K
L
M
N
P
R
S
T
U
V
W
X
Y
Z
a
b
c
d
f
g
h
i
j
k
m
n
p
q
r
s
t
u
v
w
x
P2
P22
y
z
AA
AB
AC
AD
AE
AF
AH
AJ
AK
AL
AM
AN
AP
AR
AS
AT
AU
AV
AW
AX
AY
AZ
BA
BB
BC
BD
BE
BF
BH
BJ
BK
BL
BM
BN
BP
BR
BS
BT
BU
BV
AR 904845

Figure 8-56. Test cable W131 (10554101) wiring diagram.

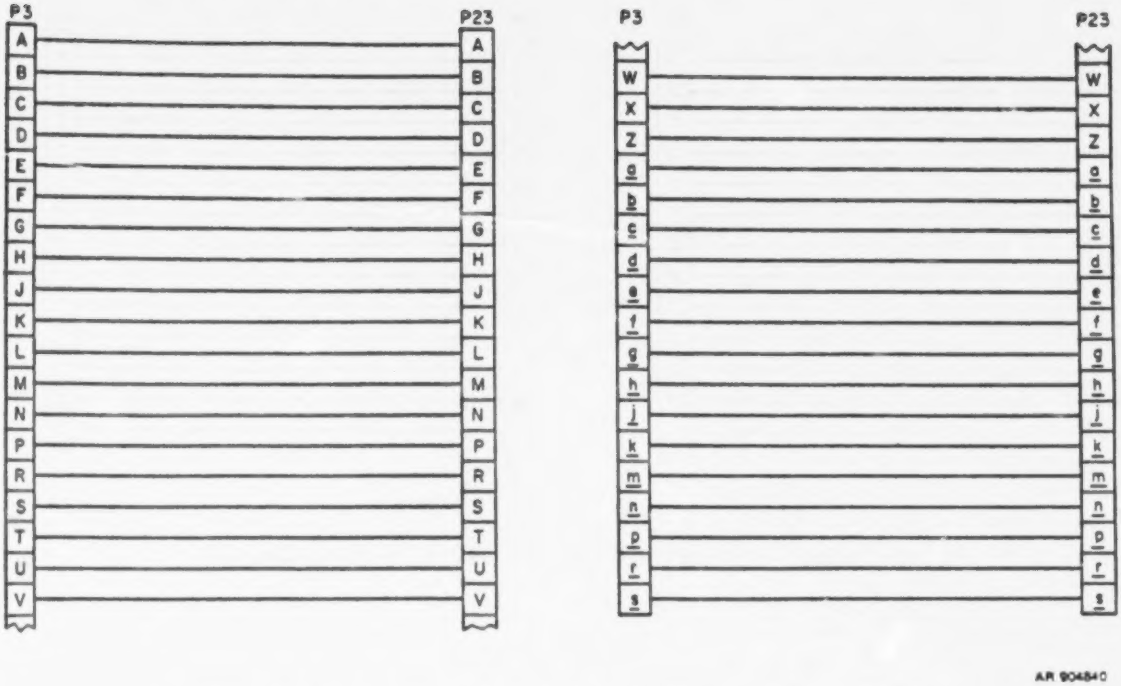

P3
P23
A B C D E F G H J K L M N P R S T U V
P3
P23
W X Z a b c d e f g h j k m n p r s
AR 904840

Figure 8-57. Test cable W132 (10554102) wiring diagram.

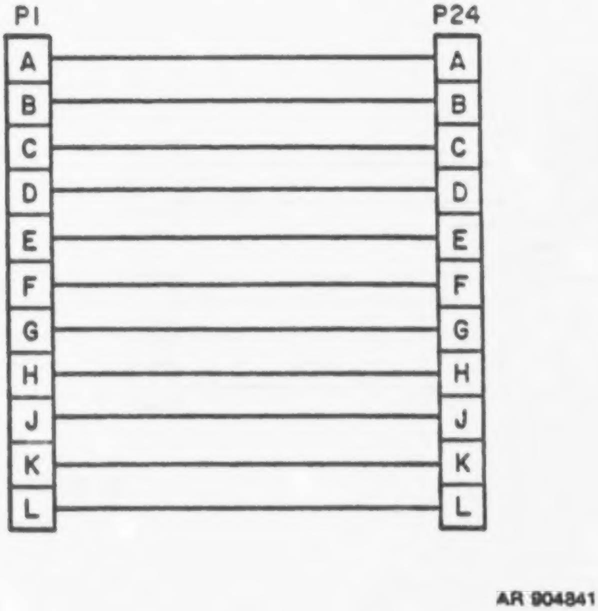

PI
P24
A B C D E F G H J K L
AR 904841

Figure 8-58. Test cable W133 (10554103) wiring diagram.

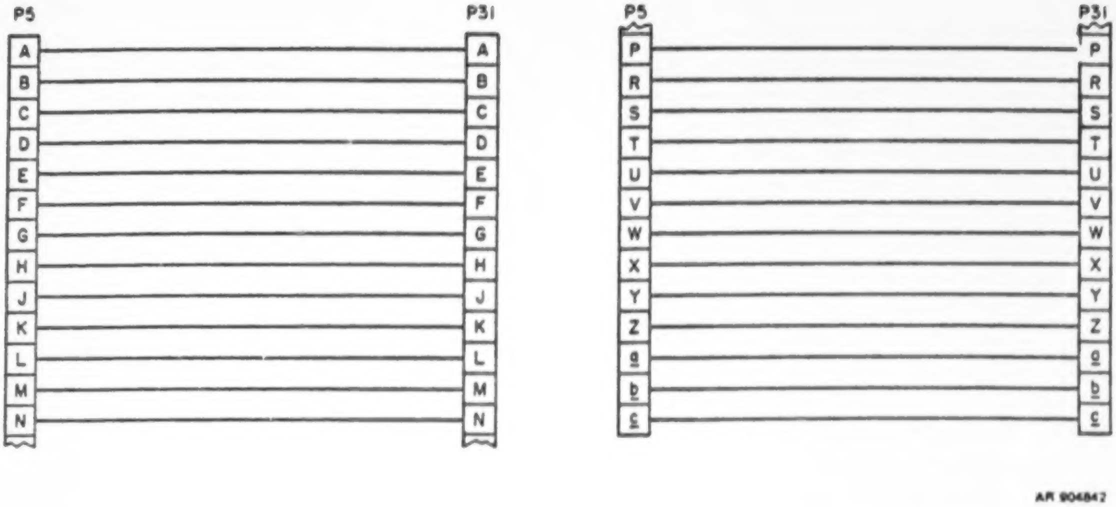

P5
P31
A
B
C
D
E
F
G
H
J
K
L
M
N
P
R
S
T
U
V
W
X
Y
Z
a
b
c
AR 904842

Figure 8-59. Test cable W134 (10554219) wiring diagram.

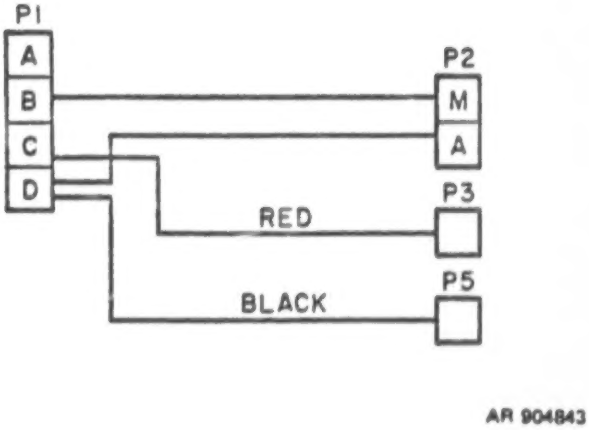
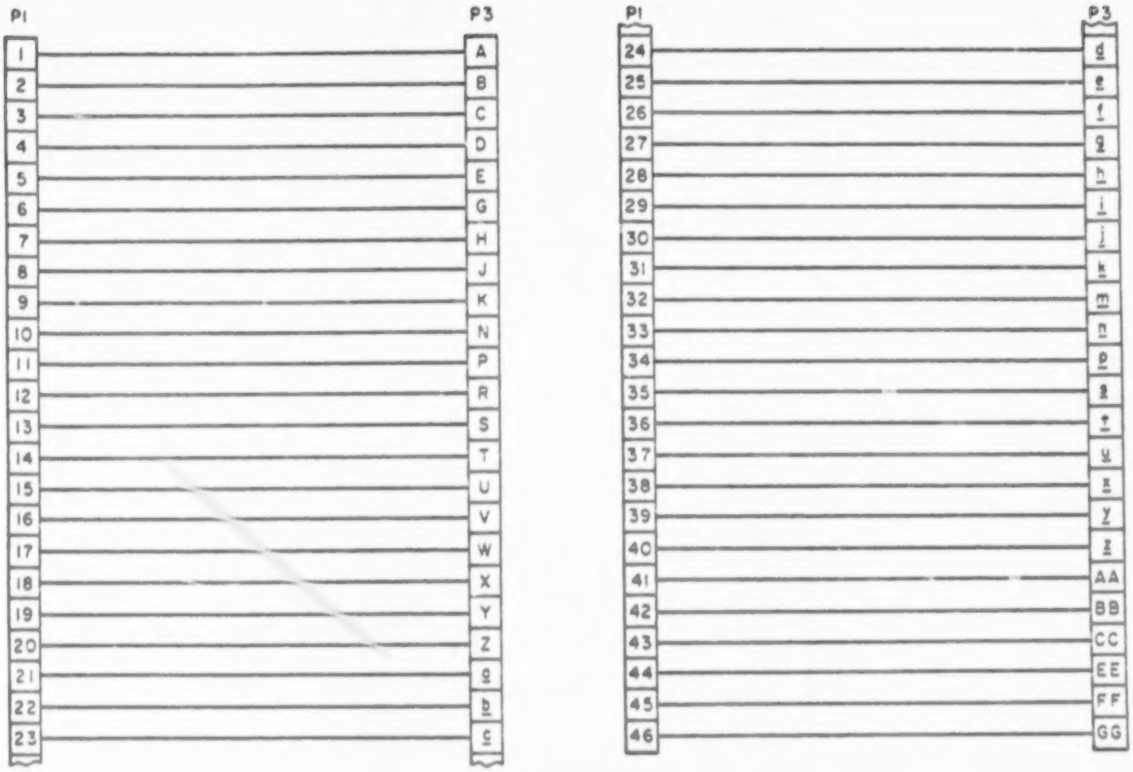
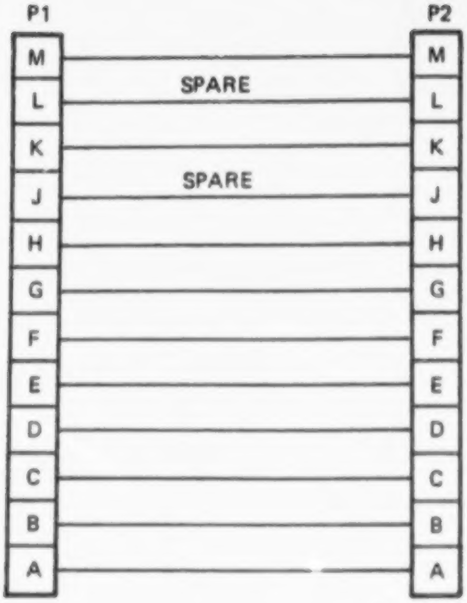

P1
A
B
C
D
P2
M
A
RED
P3
BLACK
P5
AR 904843

Figure 8-60. Test cable W137 (10556294) wiring diagram.


P1
P3
1
A
2
B
3
C
4
D
5
E
6
G
7
H
8
J
9
K
10
N
11
P
12
R
13
S
14
T
15
U
16
V
17
W
18
X
19
Y
20
Z
21
a
22
b
23
c
P1
P3
24
d
25
e
26
f
27
g
28
h
29
i
30
j
31
k
32
m
33
n
34
p
35
s
36
t
37
u
38
x
39
y
40
z
41
AA
42
BB
43
CC
44
EE
45
FF
46
GG

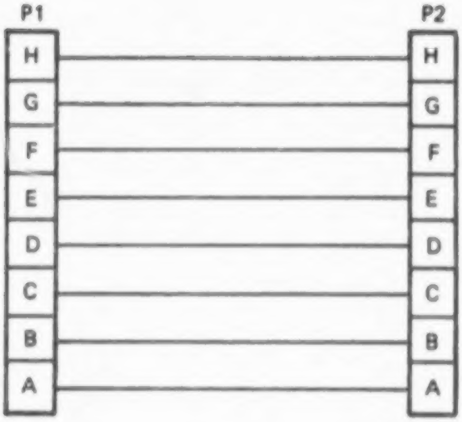
AR 904844

Figure 8-61. Test cable W138 (10554276) wiring diagram.


P1
P2
M
L
K
J
H
G
F
E
D
C
B
A
SPARE
SPARE

AR918174

Figure 8-62. Test cable W205 (11747280) wiring diagram.


P1
P2
H
G
F
E
D
C
B
A

AR918175

Figure 8-63. Test cable W206 (11747281) wiring diagram.

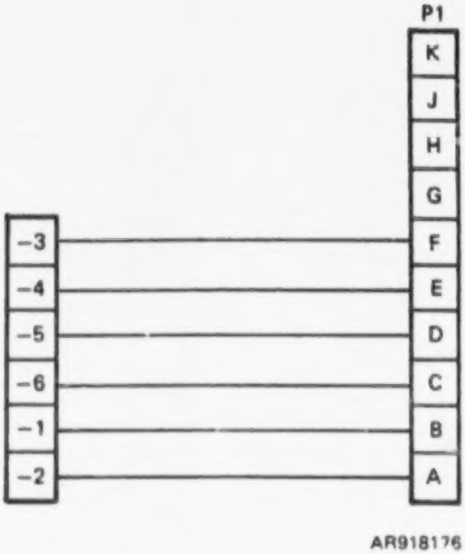

P1
K
J
H
G
-3
F
-4
E
-5
D
-6
C
-1
B
-2
A
AR918176

Figure 8-64. Test cable W207 (11747282) wiring diagram.

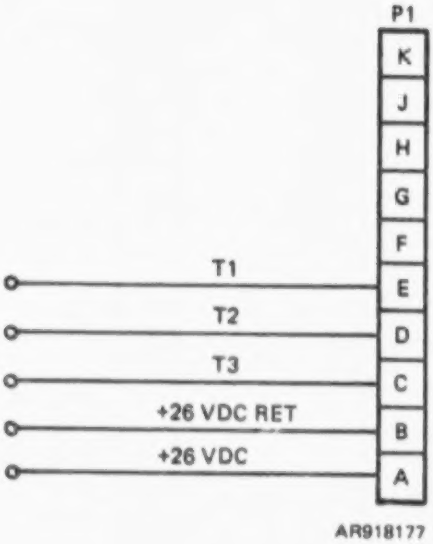

P1
K
J
H
G
F
T1
E
T2
D
T3
C
+26 VDC RET
B
+26 VDC
A
AR918177

Figure 8-65. Test cable W208 (11747283) wiring diagram.

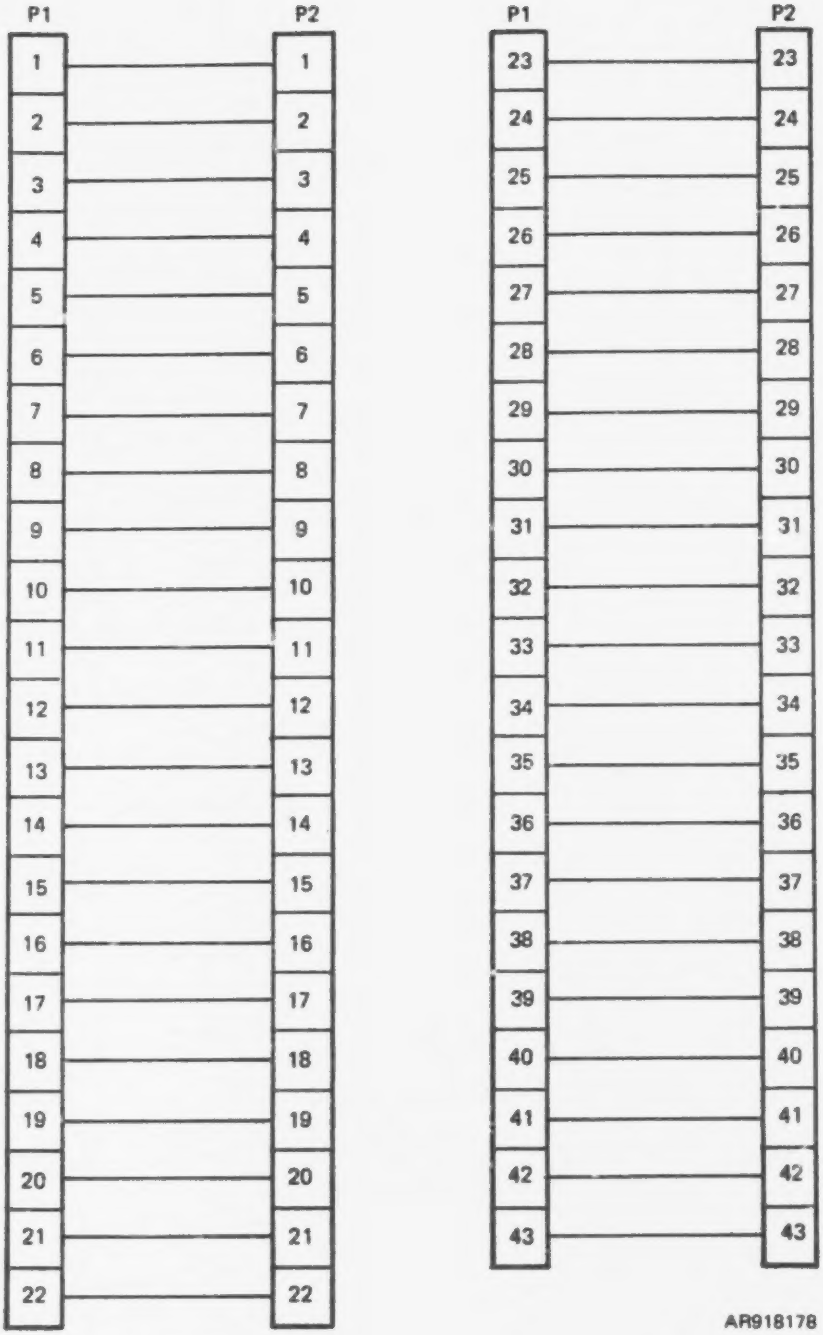

P1
P2
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
P1
P2
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
AR918178

Figure 8-66. Test cable W209 (11748245) wiring diagram.

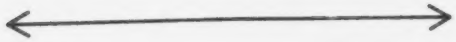


Figure 8-67. Test cable W224 (11829937) wiring diagram.

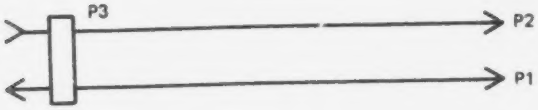


Figure 8-68. Test cable W225 (11829938) wiring diagram.

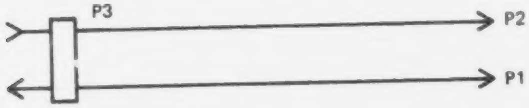


Figure 8-69. Test cable W226 (11829939) wiring diagram.

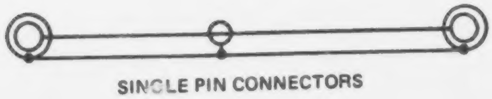

SINGLE PIN CONNECTORS

Figure 8-70. Test cable W265 (11825871-1) wiring diagram.

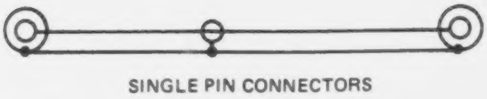

SINGLE PIN CONNECTORS

Figure 8-71. Test cable W266 (11825871-2) wiring diagram.

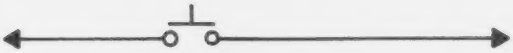


Figure 8-72. Test cable W280 (10548071) wiring diagram.

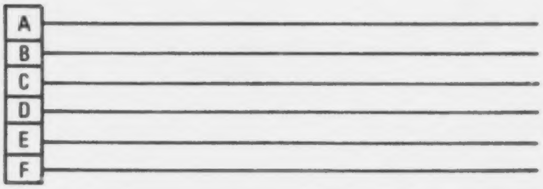


Figure 8-73. Test cable W275 (12004335) wiring diagram.

CHAPTER 9

FINAL INSPECTION

Section I. GENERAL

9-1. General. To make sure AN/TSM-100 test set assemblies are in operational condition after repair or replacement, a final inspection must be made. The inspection is to be made before assemblies are either returned to use or placed in stock. The inspection is a series of checks.

Section II. FINAL INSPECTION CHECKS

9-2. Final Inspection. Table 9-1 lists final inspection checks for each major AN/TSM-100 test set assembly repaired or replaced. References are provided for each check.

Table 9-1. AN/TSM-100 Test Set Final Inspection Checks

AN/TSM-100 Test Set assemblies repaired or replaced	Assembly reference designations	Required checks	References
AN/TSM-100 console		a. Inspect for visible damage. b. Check for completeness. c. Perform test set turn-on procedures.	Paragraph 4-1 Table 1-1 Table 2-9
Distribution box test panel (DB test panel)	2A1A2	a. Inspect for visible damage. b. Check for completeness. c. Check for proper installation. d. Perform DB test panel checkout procedures.	Paragraph 4-1 Figure 7-3 Paragraph 4-1 Table 6-6
Power panel	2A1A3	a. Inspect for visible damage. b. Check for completeness. c. Check for proper installation. d. Perform power panel checkout procedures.	Paragraph 4-1 Figure 7-4 Paragraph 4-1 Table 6-2
Battery charger *	2A1A4	a. Inspect for visible damage. b. Check for proper installation. c. Perform battery charger checkout procedures.	Paragraph 4-1 Paragraph 4-1 Paragraph 6-2
Left-hand battery	2A1A5A1	a. Inspect for visible damage. b. Check battery electrolyte level. c. Check for proper installation.	Paragraph 4-1 Paragraph 6-28 Paragraphs 6-28k and 6-28l
Inverter **	2A1A5A2	a. Inspect for visible damage and missing parts. b. Check for proper installation.	Paragraph 4-1 Paragraph 4-1

Table 9-1. AN/TSM-100 Test Set Final Inspection Checks - Continued

AN/TSM-100 Test Set assemblies repaired or replaced	Assembly reference designations	Required checks	References
Control panel	2A2A1	a. Inspect for visible damage and missing parts. b. Check for proper installation.	Paragraph 4-1 and fig. 7-10 Paragraph 4-1
Servo amplifier panel	2A2A2	a. Inspect for visible damage and missing parts. b. Check for proper installation.	Paragraph 4-1 and fig. 7-13 Paragraph 4-1
Counter *	2A2A3	a. Inspect for visible damage and missing parts. b. Check for proper installation. c. Perform counter checkout procedures.	Paragraph 4-1 Paragraph 4-1 Counter commercial manual (appendix A)
SCG servo test panel	2A2A6	a. Inspect for visible damage and missing parts. b. Check for proper installation. c. Perform SCG servo test panel test procedures.	Paragraph 4-1 and fig. 7-16 Paragraph 4-1 Table 6-11
Inverter/converter test panel	2A2A4	a. Inspect for visible damage and missing parts. b. Check for proper installation. c. Perform inverter/converter test panel checkout procedure.	Paragraph 4-1 and fig. 7-17 Paragraph 4-1 Table 6-13
Motor Load Assembly	2A2A4A1	a. Inspect for visible damage or wear and missing parts. b. Inspect for lubrication.	Paragraph 4-1 and fig. 7-14 Paragraph 2-8
Component Mounting Bracket Assembly	2A2A4A2	a. Inspect for visible damage and missing parts.	Paragraph 4-1 and fig. 7-2

Table 9-1. AN/TSM-100 Test Set Final Inspection Checks - Continued

AN/TSM-100 Test Set assemblies repaired or replaced	Assembly reference designations	Required checks	References
Resistor bracket assembly	2A2A4A3	a. Inspect for visible damage and missing parts.	Paragraph 4-1 and figure 7-10
Right-hand battery	2A2A5A1	a. Inspect for visible damage.	Paragraph 4-1
		b. Check for battery electrolyte level.	Paragraph 6-28
		c. Check for proper installation.	Paragraphs 6-28k and 6-28l.
±15 Vdc power supply **	2A2A5A2	a. Inspect for visible damage and missing parts.	Paragraph 4-1
		b. Check for proper installation.	Paragraph 4-1
AN/TSM-100 test panel assembly circuit card assemblies	2A1A1A1 2A1A2A1 to 2A1A2A8, 2A1A3A1, 2A2A2A1, 2A2A6A1 to 2A2A6A3	a. Inspect for visible damage.	Paragraph 4-1
		b. Check for completeness using appropriate circuit card assembly component layout diagram.	Figs. FO-12 through FO-25
		c. Perform appropriate circuit card assembly checkout procedures.	Tables 6-16 through 6-29
		d. Check for proper installation in appropriate test panel assembly.	Paragraph 4-1, table 1-1
AN/TSM-100 cable assemblies	W120 through W125 and W201 through W204	a. Inspect for visible damage.	Paragraph 4-1
		b. Perform continuity check.	Figures 8-23 through 8-27 and 8-30 through 8-34
		c. Check for proper installation in test set.	Fig. 1-2

Table 9-1. AN/TSM-100 Test Set Final Inspection Checks - Continued

AN/TSM-100 Test Set assemblies repaired or replaced	Assembly reference designations	Required checks	References
Adapter assemblies (accessory equipment)		a. Inspect for visible damage. b. Perform continuity check using appropriate adapter assembly schematic.	Paragraph 4-1 Figs. 8-2 and 8-11
Extender board assemblies (accessory equipment)		a. Inspect for visible damage.	Paragraph 4-1
Test cable assemblies (external)	W101 through W119, W126, W127, W131 through W134, W137, W138 and W205 through W209, W224 through W226, W265 and W266	a. Inspect for visible damage. b. Perform continuity check.	Paragraph 4-1 Figs. 8-35 through 8-66

* Maintenance instructions contained in manufacturers manuals (see Appendix A).

** Depot repaired assemblies. Assemblies can only be replaced at DS/GS maintenance level.

APPENDIX A

REFERENCES

A-1. Administrative Aids

Consolidated Index of Army Publications and Blank Forms	DA PAM 310-1
Army Equipment Record Procedures	TM38-750

A-2. Related Operating Technical Manuals

Direct Support and General Support Maintenance for Gun, Air Defense Artillery, Self-Propelled: 20MM, M163A1	TM 9-2350-300-34-1
Direct Support and General Support Maintenance for Gun, Air Defense Artillery, Towed: 20MM M167A1	TM 9-1005-286-34-1
Operator, Organizational, and Direct Support and General Support Maintenance for Test Set, Air Defense Artillery: AN/MWM-3	TM 9-4933-215-14&P

A-3. Related Maintenance Technical Manuals

Direct Support Maintenance Repair Parts and Special Tools List (Includes Depot Maintenance Repair Parts) for AN/TSM-100 Test Set	TM 9-4933-210-30P
Painting Instructions for Field Use	TM 43-0139
Operator, Organizational DS, GS and Depot Maintenance Manual, Aircraft and Non-aircraft Nickel-Cadmium Batteries (General)	TM 11-6140-203-14-1
Operator, Organizational, DS, GS, and Depot Maintenance Manual Including Repair Parts and Special Tools Lists, Non-aircraft Nickel-Cadmium Batteries	TM 11-6140-203-14-3
Operator, Organizational, DS, and GS Maintenance Manual for Charger, Battery: SVC-40-2-M-D3 Including Repair Parts and Special Tools Lists	TM 9-6130-300-14

A-4. Related Commercial Maintenance Manuals

NJE Corporation, Power Supplies, Unlimited Instruction Manual for SVC Line (Model 40-20-0-40 VDC, 0-20 AMP Battery Charger 2A1A4 in AN/TSM-100)

A-5. Related Test Equipment Manuals

Operator, Organizational, Direct Support and General Support Maintenance Manual for Test Set, Radar AN/TPM-22A	TM 9-4931-334-13
Operator, Organizational, Direct Support and General Support Maintenance Manual for Chart Recorder Model 7402A, option 137	TM 9-6625-2802-14&P
Operator, Organizational, Direct Support and General Support Maintenance Manual for Reflectometer Model 1502	TM 9-6625-2801-14&P

best copy available

A-6. Related Calibration Manuals

Calibration Requirements for the Maintenance of Army Material	TB 43-180
Calibration Procedure for Test Set, Electronics System AN/TSM-100	TB 9-4933-210-34
Calibration Procedure for Battery Charger (0-40 Vdc) A1A4 in AN/TSM-100	TB 9-6130-300-14
Calibration Procedure for Chart Recorder Model 7402A	TB 9-6625-2802-35

A-7. Other Related Publications

Administrative Storage	TM 740-90-1
Destruction to Prevent Enemy Use	TM 750-244-2

APPENDIX B

COMPONENTS OF END ITEM LIST

Section I. INTRODUCTION

B-1. Scope.

This appendix lists integral components of and basic issue items for the Test Set, AN/TSM-100 to help you inventory items required for safe and efficient operation.

B-2. General.

This Components of End Item List is divided into the following sections:

a. Section II. Integral Components of the End Item. These items, when assembled, comprise the Test Set, AN/TSM-100 and must accompany it whenever it is transferred or turned in. The illustrations will help you identify these items.

b. Section III. Basic Issue Items. These are the minimum essential items required to place the Test Set, AN/TSM-100 in operation, to operate it, and to perform emergency repairs. Although shipped separately packed they must accompany the Test Set, AN/TSM-100 during operation and whenever it is transferred between accountable officers. The illustrations will assist you with hard-to-identify items. This manual is your authority to requisition replacement BII, based on the TOE/MTOE authorization of the end item.

B-3. Explanation of Columns.

a. Illustration. This column is divided as follows:

(1) Figure Number. Indicates the figure number of the illustration on which the item is shown.

(2) Item Number. The number used to identify item called out in the illustration.

b. National Stock Number. Indicates the National stock number assigned to the item and which will be used for requisitioning.

c. Part Number. Indicates the primary number used by the manufacturer, which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards, and inspection requirements to identify an item or range of items.

d. Description. Indicates the Federal item name and, if required, a minimum description to identify the item.

e. Location. The physical location of each item listed is given in this column. The lists are designed to inventory all items in one area of the major item before moving on to an adjacent area.

f. Quantity Required (Qty Reqd). This column lists the quantity of each item required for a complete major item.

g. Quantity. This column is left blank for use during inventory. Under the Rcv'd column, list the quantity you actually receive on your major item. The Date columns are for your use when you inventory the major item at a later date; such as for shipment to another site.

(1) ILLUSTRATION		(2)	(3)	(4)	(5)	(6)	(7)	(8) QUANTITY			
(a) FIGURE NO.	(b) ITEM NO.	NATIONAL STOCK NUMBER	PART NO.	DESCRIPTION	LOCATION	USABLE ON CODE	QTY. REQ'D.	RCV'D.	DATE	DATE	DATE

Section II
INTEGRAL COMPONENTS OF END ITEM

NOT APPLICABLE

Section III

BASIC ISSUE ITEMS

NOT APPLICABLE

APPENDIX C

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

C-1. General.

a. The maintenance allocation chart identifies the maintenance operations that must be performed. It assigns each of those operations to the lowest level of maintenance authorized to perform the complete task, or any part of the task, in terms of availability of time, tools, test and support equipment, skills and employment of the subsystem.

b. The Maintenance Allocation Chart (MAC) in section II designates overall responsibility for the performance of maintenance functions for the AN/TSM-100.

c. Section III lists the special tools and test equipment required for each maintenance function as referenced from section II.

d. Section IV contains supplemental instructions on explanatory notes for a particular maintenance function.

C-2. Maintenance Functions.

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical and/or electrical characteristics with established standards through examination.

b. Test. To verify serviceability and detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (decontaminate), preserve, drain, paint or replenish fuel, lubricants, hydraulic fluids, or compressed air supplied.

d. Adjust. To maintain, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to specified parameters.

e. Align. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test, measuring and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Install. The act of emplacing, seating, or fixing into position an item, part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

h. Replace. The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

i. Repair. The application of maintenance services[1] or other maintenance actions[2] to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assmbly), and items, or system.

j. Overhaul. The maintenance effort (services/actions) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e., DMWR) in appropriate technical publication. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of material maintenance applied to Army's equipment. The rebuild operation includes the act of returning to zero those age measurements (hours/miles, etc.) considered in classifying Army equipments/components.

C-3. Column Entries Used in the MAC.

a. Column 1, Group Number. Column 1 lists group numbers, the purpose of which is to identify components, assemblies, subassemblies, and modules with the next higher assembly.

b. Column 2, Component/Assembly. Column 2 contains the names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Functions. Column 3 lists the functions to be performed on the item listed in column 2. (For detailed explanation of these functions, see para. B-2).

d. Column 4, Maintenance Category.

(1) Column 4 specifies, by the listing of a "work time" figure in the appropriate sub-column(s), the lowest level of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform the maintenance function, at the indicated level of maintenance.

(2) If the number or complexity of the tasks within the listed maintenance function vary at different maintenance, appropriate "work time" figures will be shown for each level. The number of man-hours specified by the "work time" figure represents the average time required to restore an item (assembly, subassembly, components, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time, troubleshooting time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. The symbol designations for the various maintenance levels are as follows:

C - Operator or crew.
O - Organizational maintenance.
F - Direct support maintenance.
H - General support maintenance.
D - Depot maintenance.

e. Column 5, Tools and Equipment. Column 5 specifies, by code, those common tool sets (not individual tools) and special tools, test, and support equipment required to perform the designated function.

f. Column 6, Remarks. Column 6 contains a letter code in alphabet order

[1] Services - inspect, test, service, adjust, align, calibrate, or replace.

[2] Action - welding, grinding, riveting, straightening, facing, remachining, or resurfacing.

which is keyed to the remarks contained in section IV.

C-4. Column Entries Used in Tool and Test Equipment Requirements (Section III).

a. Column 1, Tool or Test Equipment Reference Code. The tool and test equipment reference code correlates with a maintenance function on the identified end item or component.

b. Column 2, Maintenance Category. The lowest level of maintenance authorized to use the tool or test equipment.

c. Column 3, Nomenclature. Name or identification of the tool or test equipment.

d. Column 4, National/NATO Stock Number. The National or NATO stock number of tool or test equipment.

e. Column 5, Tool Number. The manufacturer's part number.

C-5. Explanation of Columns to Section IV.

a. Reference Code. The code scheme recorded in column 1, section III.

b. Remarks. This column lists information pertinent to the maintenance function being performed as indicated on the MAC, section II.

SECTION II

MAINTENANCE ALLOCATION CHART

Group Number	Component/Assembly	Maintenance Function	Maintenance Level					Tools and Equipment	Remarks
			C	O	F	H	D		
01	Electronics System Test Set, AN/TSM-100A (11836267)	Inspect	0.3		0.4				
		Test			1.5			1, 2, 4, 5	
		Service	0.4		0.4				
		Adjust			1.0			6	G
		Install					*		
		Replace					*		
		Repair			*		*		
		Overhaul					*		
0101	Bracket Assembly (10554146)	Inspect			0.1				
		Test			0.8			1, 2, 4	
		Repair			0.8			6	G
010101	Component Assy (10554200)	Inspect			0.1				
		Replace			0.1			6	G
		Repair			0.3			6	G
0102	Right-Hand Battery Assy (10554062)	Inspect	0.1		0.1				
		Service	*		*				A
		Replace			0.3			6	G
		Repair			*				
0103	Left-Hand Battery Assy (10554063)	Inspect	0.1		0.1				
		Service	*		*				A
		Replace			0.3			6	G
		Repair			*				
0104	Bracket Assembly (10554150)	Inspect			0.1				
		Test			0.8			1, 2, 4	
		Repair			0.8			6	G
0105	Sight Current Generator Test Panel Assy (10554002)	Inspect	0.3		0.3				
		Test			0.4			1,2,3,4,5	
		Align			0.2			6	G
		Replace			0.2			6	G
		Repair			0.6			6	G
010501	Electronic Component Assy (10554188)	Inspect			0.1				
		Test			0.4			1, 2, 4, 5	
		Replace			0.1			6	G
		Repair			0.5			6	G
010502	Range Electromagnet (10545126)	Inspect			0.1				
		Replace			0.2			6	G
		Repair			0.3			6	G

*In this category, no specific times can be established.

MAINTENANCE ALLOCATION CHART - CONTINUED

Group Number	Component /Assembly	Maintenance Function	Maintenance Level C	O	F	H	D	Tools and Equipment	Remarks
0106	Distribution Box	Inspect			0.3				
	Test Panel Assy	Test			0.6			1, 2, 4	
	(10554006)	Replace			0.2			6	G
		Repair			2.0			6	G
010601	Elec Comp Assy,	Inspect	0.1		0.1				
	Noise Suppression	Test			0.2			1, 2, 4, 5	
		Replace			0.1			6	G
	(10054208)	Repair			0.5			6	G
010602	Elec Comp Assy,	Inspect			0.1				
	Relay Time	Test			0.2			1, 2, 4, 5	
		Replace			0.1			6	G
	(10554189)	Repair			0.5			6	G
010603	Elec Comp Assy,	Inspect			0.1				
	K11 Operation and	Test			0.4			1, 2, 4, 5	
	Sequence	Replace			0.1			6	G
	(10554165)	Repair			0.5			6	G
010604	Elec Comp Assy, K8	Inspect			0.1				
	Operation and	Test			0.4			1, 2, 4, 5	
	Sequence	Replace			0.1			6	G
	(10554164)	Repair			0.5			6	G
010605	Elec Comp Assy, K6	Inspect			0.1				
	Operation and	Test			0.4			1, 2, 4, 5	
	Sequence	Replace			0.1			6	G
	(10554185)	Repair			0.5			6	G
010606	Elec Comp Assy,	Inspect			0.1				
	Relay Sense and K12	Test			0.4			1, 2, 4, 5	
	Operation	Replace			0.1			6	G
	(10554179)	Repair			0.5			6	G
010607	Elec Comp Assy,	Inspect			0.1				
	Relay Sense Resis-	Test			0.3			1, 2, 4, 5	
	tors	Replace			0.1			6	G
	(10554184)	Repair			0.5			6	G
010608	Elec Comp Assy,	Inspect			0.1				
	Logic Function	Test			0.2			1, 2, 4, 5	
	Resistors	Replace			0.1			6	G
	(10554163)	Repair			0.5			6	G

MAINTENANCE ALLOCATION CHART - CONTINUED

Group Number	Component /Assembly	Maintenance Function	Maintenance Level C	O	F	H	D	Tools and Equipment	Remarks
0107	Power Panel Assy (10554036)	Inspect	0.3		0.3				
		Test			0.6			1, 2, 4	
		Replace			0.2			6	G
		Repair			1.5			6	G
010701	Elec Comp Assy, Power Unit (10554186)	Inspect			0.1				
		Test			0.4			1, 2, 4, 5	B
		Replace			0.1			6	G
		Repair			0.5			6	G
0108	Control Panel Assy (11748027)	Inspect	0.2		0.2				
		Test			0.4			1, 2, 4	
		Replace			0.2			6	G
		Repair			1.0			6	G
0109	Servo Amplifier Test Panel Assy (11748029)	Inspect	0.2		0.2				
		Test			0.3			1, 2, 4	
		Replace			0.2			6	G
		Repair			2.0			6	G
010901	Electronic Comp Assy (11748031)	Inspect			0.1				
		Test			0.3			1, 2, 4, 5	
		Replace			0.1			6	G
		Repair			0.5			6	G
0110	Test Set, Inverter, Converter and Motor Chassis Assembly (11748238)	Inspect			0.1				
		Test			1.0				
		Replace			0.5			6	G
		Repair			1.0			6	G
011001	Motor Assy (10554142)	Inspect	0.1		0.1				
		Test			0.2			1	
		Service	*		0.1				
		Replace			0.4			6	G
		Repair			0.8			6	G
0111	Panel Assembly (11747100)	Inspect			0.1				
		Test			1.0			1, 2	
		Replace			0.5			6	G
		Repair			1.0			6	G
011101	Bracket Assembly (11747093)	Inspect			0.1				
		Test			1.0				
		Replace			0.5				
		Repair			1.0				

*In this category, no specific times can be established.

MAINTENANCE ALLOCATION CHART - CONTINUED

Group Number	Component/Assembly	Maintenance Function	Maintenance Level					Tools and Equipment	Remarks
			C	O	F	H	D		
011102	Panel, Test, Electrical Assembly (11747084)	Inspect Test Replace Repair			0.1 1.0 0.5 1.0				
011103	Converter Digital (10548359)	Inspect Test Replace Repair			0.1 0.5 0.2 0.8			 1, 2, 3 6 6	 G G
011104	Converter, Range Rate D/A (10548330)	Inspect Test Replace Repair			0.1 0.5 0.2 0.8			 1, 2, 3	
011105	Range and Range Rate PC Board Assembly (11747101)	Inspect Test Replace Repair			0.1 0.5 0.2 0.8			 1, 2, 3 6 6	 G G
0112	Test Set, Inverter, Converter panel Assembly (11747097)	Inspect Test Replace Repair			0.1 1.0 0.1 1.0			 6 6	 G G
0113	Vented Panel Assy (10554104)	Inspect Replace Repair			0.1 0.1 0.1			 6 6	 G G
0114	AN/TSM-100A Accessory Equipment								C
011401	Extender Board Assy SCG Magnet & Torque Motor (10554283)	Inspect Test Replace Repair			0.1 0.1 0.1 0.3			 1 6 6	 G G
011402	Test Unit Adapter (10554265)	Inspect Test Replace Repair			0.1 0.4 0.1 0.5			 1 6 6	 G G
011403	Extender Board Assy, AN/MWM-3 Set (8438956)	Inspect Test Replace Repair			0.1 0.1 0.1 0.3			 1 6 6	 G G

MAINTENANCE ALLOCATION CHART - CONTINUED

Group Number	Component /Assembly	Maintenance Function	Maintenance Level					Tools and Equipment	Remarks
			C	O	F	H	D		
011404	Extender Board Assy, Distribution Box (10554267)	Inspect			0.1				
		Test			0.1			1	
		Replace			0.1			6	G
		Repair			0.3			6	G
011405	Extender Board Assy, Distribution Box & SCG(10554271)	Inspect	0.1		0.1				
		Test			0.1			1	
		Replace			0.1			6	G
		Repair			0.3			6	G
011406	Extender Board Assy, Distribution Box (10554268)	Inspect	0.1		0.1				
		Test			0.1			1	
		Replace			0.1			6	G
		Repair			0.3			6	G
011407	Extender board Assy, Distribution Box & SCG (10554270)	Inspect	0.1		0.1				
		Test			0.1			1	
		Replace			0.1			6	G
		Repair			0.3			6	G
011408	Extender Board Assy, Distribution Box (10554291)	Inspect	0.1		0.1				
		Test			0.1			1	
		Replace			0.1			6	G
		Repair			0.3			6	G
011409	Deleted.								
011410	Adapter, Test Set (11748235)	Inspect			0.1				
		Test			0.5				
		Repair			1.0				
0114101	Board Assembly SCG Test (11748240)	Inspect			0.1				
		Test			0.5				
		Repair			1.0				
011411	Auxillary Position Indicator (8438963)	Inspect			0.1				
		Test			0.5				
		Repair			1.0				
011412	Deleted.								

MAINTENANCE ALLOCATION CHART - CONTINUED

Group Number	Component/Assembly	Maintenance Function	Maintenance Level					Tools and Equipment	Remarks
			C	O	F	H	D		
0115	AN/TSM-100A Internal Cables								C
011501	Cable Assy. W123 (10554144)	Inspect			0.2				
		Test			0.2			1	
		Replace			0.6			6	G
		Repair			1.5			6	G
0116	AN/TSM-100A External Cables								C
0117	DC-DC Power Supply (2A2A5A2) (10545599)	Inspect	0.1		0.1				
		Test			0.1			1	
		Adjust			0.1			6	G
		Replace			0.2			6	G
		Repair					*		
0118	Power Static Inverter (2A1A5A2) (10545536)	Inspect			0.1				
		Test			1.0				
		Replace			0.2			6	G
		Repair					*		D
0119	Battery Charger (2A1A4) (10556495)	Inspect	0.1		0.1				
		Test			0.3				
		Replace			0.2			6	G
		Repair					*		E
0120	Counter Electronic (2A2A3) (11825310)	Inspect			0.1				
		Test			0.5				
		Replace			0.2			6	G
		Repair					*		F

*In this category, no specific times can be established.

Section III.

TOOL AND TEST EQUIPMENT REQUIREMENTS

Ref Code	Maint Level	Nomenclature	Tool Number
1	F	Multimeter, AN/USM-486	681098
2	F	Oscilloscope, OS-261/U	475
3	F	Radar Test Set, AN/TPM-22A	11836262
4	F	Shelter, AN/TSM-115A	11836265
5	F	Test Set Subassy, MX-8050/TPM-22A	11726306
6	C,F	Tool Kit, DS/GS Electronics	

Section IV. REMARKS

Ref Code	
A	Defective cells must be replaced with a replacement cell from the same vendor. Return batteries to nickel-cadmium battery maintenance facility and service according to TM 11-6140-203-14-4&P.
B	To test 2A1A3A1, a spare functioning 2A1A3A1 must be installed in the Power Panel, 2A1A3.
C	Refer to individual accessory items for authorization of maintenance tasks.
D	For repair of the Power Static Inverter (other than replacement of fuse wire) return to depot.
E	For repair of the Battery Charger refer to TM-9-6130-300-14.
F	For repair of the Counter refer to commercial manual supplied with the equipment.
G	For repair of assembly/component use tool kit SC 4931-95-CL-A13. Use as required.

APPENDIX D

EXPENDABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

D-1. Scope

This appendix lists expendable supplies and materials you will need to operate and maintain the test set. These items are authorized to you by the Common Table of Allowances (CTA) 50-790, Expendable Items (Except Medical, Class V, Repair Parts, and Heraldic Items).

D-2. Explanation of Columns

a. Column 1 - Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., "Use cleaning compound, item 5, App. D").

b. Column 2 - Level. This column identifies the lowest level of maintenance that requires the listed item.

C - Operator/Crew
O - Organizational Maintenance
F - Direct Support Maintenance
H - General Support Maintenance

c. Column 3 - National Stock Number. This is the National stock number assigned to the item; use it to request or requisition the item.

d. Column 4 - Description. Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the part number followed by the Federal Supply Code for Manufacturer (FSCM) in parentheses, if applicable.

e. Column 5 - Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two character alphabetical abbreviation (ea.-each; A/R-as required; in-inches; pr.-pair). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

Section II. EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
1	F	9150-00-754-2595	Grease MIL G 21164	A/R
2	F	7920-00-965-1709	Paper towel Kaydry 3472	A/R
3	F	6840-00-935-9813	General purpose detergent	A/R
4	F	6850-00-264-9037	Dry cleaning solvent	A/R
5	F	8010-00-246-6115	Mineral spirits paint thinner	A/R
6	F	9150-00-273-2389	Lubricating oil	A/R

INDEX

Subject	Paragraph, Figure, Table Number
A	
Access panel, repair	7-14
AN/MWM-3 test set, extender board assemblies	1-6b(12)(a)8
AN/TSM-100 test set	1-6b 2-3
Accessory equipment:	
Test cables	1-6b(12)
Description	1-6b(12)(a)
General Repair	6-23
Test and Troubleshooting	8-1
B	
Battery charger installation	6-1b
Battery maintenance	6-27
Binding post adapter	1-6b(12)(a)5
C	
Charging, battery	6-27b
Cleaning, AN/TSM-100	2-6
Cleaning battery assemblies	6-27
Common repair and replacement	7-4
Component bracket assembly	1-6b(9)(b)
Console installation	6-1a
Controls and indicators	2-1
Control panel:	
Description	1-6b(6)
Installation	6-1f
Functional analysis of equipment	3-7
Repair	7-8
Component board, functional analysis	3-23
Counter:	
Description	1-6b(8)
Installation	6-1e
D	
Damaged components, inspection of	4-16
Data, tabulated	1-7
Description, AN/TSM-100	1-6

Subject — Paragraph, Figure, Table Number

Distribution box panel:
  Description .... 1-6b(2)
  Installation 6-1d
  Functional analysis 3-6
  Repair 7-6
Distribution box panel circuit card assemblies:
  Logic function resistors:
    Functional analysis 3-14
    Test and troubleshooting 6-11
  Relay sense resistors:
    Functional analysis 3-15
    Test and troubleshooting 6-12
  Relay sense and K12 operation:
    Functional analysis 3-16
    Test and troubleshooting 6-13
  K6 operation and sequence:
    Functional analysis 3-17
    Test and troubleshooting 6-14
  K8 operation and sequence:
    Functional analysis 3-18
    Test and troubleshooting 6-15
  K11 operation and sequence:
    Functional analysis 3-19
    Test and troubleshooting 6-16
  Relay time:
    Functional analysis 3-20
    Test and troubleshooting 6-17
  Noise suppression:
    Functional analysis 3-21
    Test and troubleshooting 6-18

E

Electrolyte inspection 6-28
Electronic component assembly 7-11
Extender boards
  AN/MWM-3 test set .... 1-6b(12)(a)8
  AN/TSM-100 and SCG .... 1-6b(12)(a)7
  SCG torque and magnet .... 1-6b(12)(a)6

F

Final inspection
  Forms 1-2

G

General repair, accessory equipment 8-1

Subject	Paragraph, Figure, Table Number
I	
Identification plates	1-8
Installation, see specific item	
Inspection:	
Damaged components	4-1b
Inverter/converter test panel:	
Description	1-6b(9)
Installation	6-1g
Functional analysis	3-8d
Repair	7-13
Inverter, static	1-6b(5)(b)
L	
Left-hand battery and inverter:	
Description	1-6b(5)
Removal and installation	6-27
Repair	6-30
Lubrication	4-1e
M	
Maintenance allocation	B-1
Motor load assembly:	
Description	1-6b(9)(a)
Repair	7-10
O	
Operating procedures	2-2
P	
Painting	4-1d
Power, connections at installation	6-1h
Power distribution analysis, AN/TSM-100	3-4
Power Panel:	
Description	1-6b(3)
Installation	6-1c
Repair	7-7
Power panel circuit card:	
Functional analysis	3-12
Test and troubleshooting	6-9
Power supply ± 15 Vdc	1-6b(10)(b)

Subject	Paragraph, Figure, Table Number
Preparation:	
For shipping	6-3
Preventive maintenance:	
Inspection	4-1b
Checks and services	T2-10

R

Records	1-2
Removal of major components	6-31
Repair:	
Of test cables	8-2
Responsibilities	7-1
Right-hand batter and ± 15 Vdc power supply:	
Description	1-6b(10)
Removal and installation	6-27

S

Service on receipt:	
Of AN/TSM-100 shelter-mounted materiel	6-2
Of packaged materiel	6-1
Servo amplifier panel:	
Description	1-6b(7)
Installation	6-1d
Functional analysis	3-8
Repair	7-9
Servo amplifier load, functional analysis	3-8d
Servo amplifier circuit card:	
Functional analysis	3-22
Test and troubleshooting	6-19
Sight current generator panel:	
Description	1-6b(1)
Installation	6-1d
Functional analysis	3-5
Repair	7-5
Sight current generator panel assemblies:	
Circuit card assembly:	
Description	1-6b(1)
Functional analysis	3-13
Test and troubleshooting	6-10
Range electromagnet, description	1-6b(1)
Torque motor, description	1-6b(1)
SCG servo test panel:	
Description	1-6b(11)
Installation	6-1d
Function analysis	3-9
Repair	7-12

Subject	Paragraph, Figure, Table Number
SCG servo test panel circuit card assemblies:	
Range D/A converter:	
Functional analysis	3-25
Test and troubleshooting	6-21
Range rate D/A converter	
Functional analysis	3-26
Test and troubleshooting	6-22
Range and range rate generator	
Functional analysis	3-24
Test and troubleshooting	6-20
Slides	6-31d
Static inverter	1-66(5)(b)

T

Test cable, repair	8-2
Test circuit cards	6-7
Turn-on procedure	T2-9

W

Warning plate	T1-6

X, Y Z

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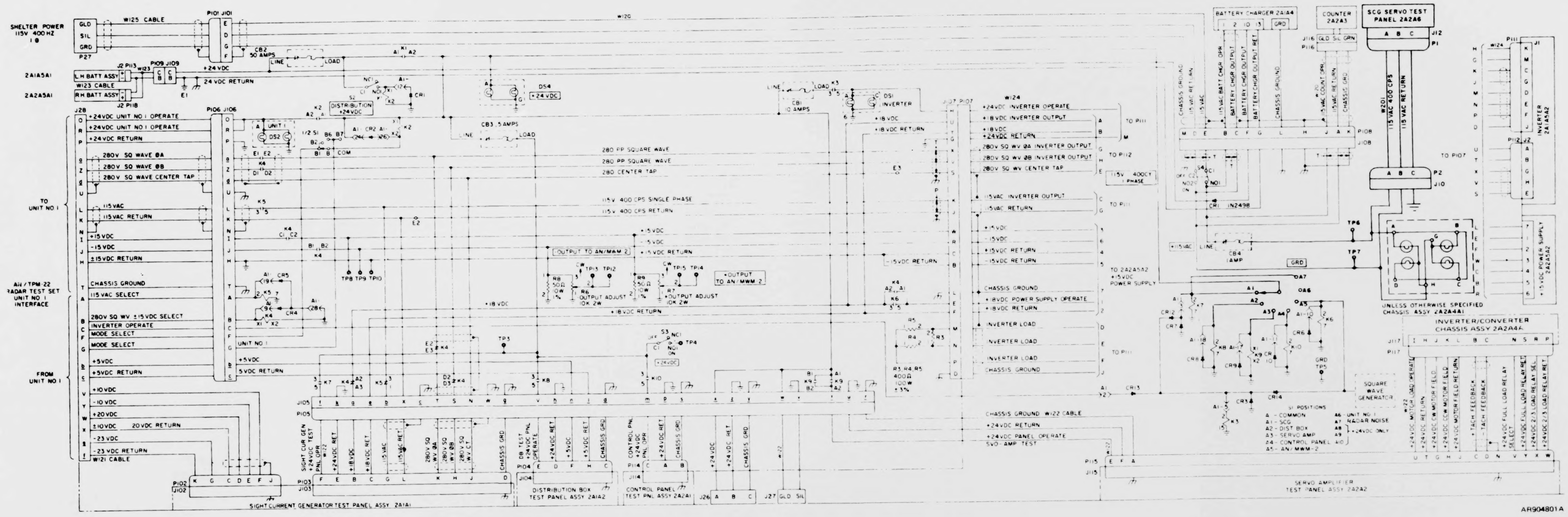
SHELTER POWER 115V 400 HZ 1 Ø
P27
W125 CABLE
P101 J101
W120
CB2 50 AMPS
LINE
LOAD
+24 VDC
24 VDC RETURN
2A1A5A1
L H BATT ASSY
W123 CABLE
2A2A5A1
R H BATT ASSY
J2 P113
J2 P118
P109 J109
DISTRIBUTION +24VDC
DS4
CB3 .5 AMPS
CB1 10 AMPS
DS1 INVERTER
J28
P106 J106
+24VDC UNIT NO 1 OPERATE
+24VDC UNIT NO 1 OPERATE
+24VDC RETURN
280V SQ WAVE ØA
280V SQ WAVE ØB
280V SQ WAVE CENTER TAP
TO UNIT NO 1
115VAC
115VAC RETURN
+15VDC
-15VDC
±15VDC RETURN
AN/TPM-22 RADAR TEST SET UNIT NO 1 INTERFACE
CHASSIS GROUND
115VAC SELECT
280V SQ WV ±15VDC SELECT
INVERTER OPERATE
MODE SELECT
MODE SELECT
FROM UNIT NO 1
+5VDC
+5VDC RETURN
+10VDC
-10 VDC
+20VDC
±10VDC
20VDC RETURN
-23 VDC
-23 VDC RETURN
W121 CABLE
UNIT NO 1
5VDC RETURN
280 PP SQUARE WAVE
280 PP SQUARE WAVE
280 CENTER TAP
115V 400 CPS SINGLE PHASE
115V 400 CPS RETURN
OUTPUT TO AN/MWM-2
OUTPUT ADJUST 10K 2W
OUTPUT TO AN/MWM-2
+18 VDC
+18 VDC RETURN
TP8 TP9 TP10
TP3
TP4
SIGHT CURRENT GENERATOR TEST PANEL ASSY 2A1A1
DISTRIBUTION BOX TEST PANEL ASSY 2A1A2
CONTROL PANEL TEST PNL ASSY 2A2A1
P102 J102
P103 J103
P104 J104
P105 J105
J26
J27
R3, R4, R5 400Ω 100W ±5%
J107 P107
W124
+24VDC INVERTER OPERATE
+18VDC INVERTER OUTPUT
+18VDC
+24VDC RETURN
280V SQ WV ØA INVERTER OUTPUT
280V SQ WV ØB INVERTER OUTPUT
280V SQ WV CENTER TAP
TO P111
TO P112
115V 400CY 1 PHASE
115VAC INVERTER OUTPUT
115VAC RETURN
+15VDC
-15VDC
+15VDC RETURN
-15VDC RETURN
TO 2A2A5A2 +15VDC POWER SUPPLY
CHASSIS GROUND
+18VDC POWER SUPPLY OPERATE
+18VDC RETURN
INVERTER LOAD
INVERTER LOAD
INVERTER LOAD
CHASSIS GROUND
CHASSIS GROUND W122 CABLE
+24VDC RETURN
+24VDC PANEL OPERATE
SVO-AMP TEST
BATTERY CHARGER 2A1A4
COUNTER 2A2A3
SCG SERVO TEST PANEL 2A2A6
J12
P1
W201
115 VAC 400 CPS
115 VAC RETURN
P2
J10
P108
J108
J116
P116
CR1 1N2498
CB4 1AMP
+115VAC
GRD
TP6
TP7
UNLESS OTHERWISE SPECIFIED CHASSIS ASSY 2A2A4A1
INVERTER 2A1A5A2
+15VDC POWER SUPPLY 2A2A5A2
TO P107
INVERTER/CONVERTER CHASSIS ASSY 2A2A4A
J117
P117
SQUARE WAVE GENERATOR
S1 POSITIONS
A - COMMON
A1 - SCG
A2 - DIST BOX
A3 - SERVO AMP
A4 - CONTROL PANEL
A5 - AN/MWM-2
A6 - UNIT NO 1
A7 - RADAR NOISE
A8
A9
A10
+24VDC ONLY
GRD TP5
P115
J115
SERVO AMPLIFIER TEST PANEL ASSY 2A2A2
AR904801A

FO-1. AN/TSM-100 test power distribution, simplified schematic.

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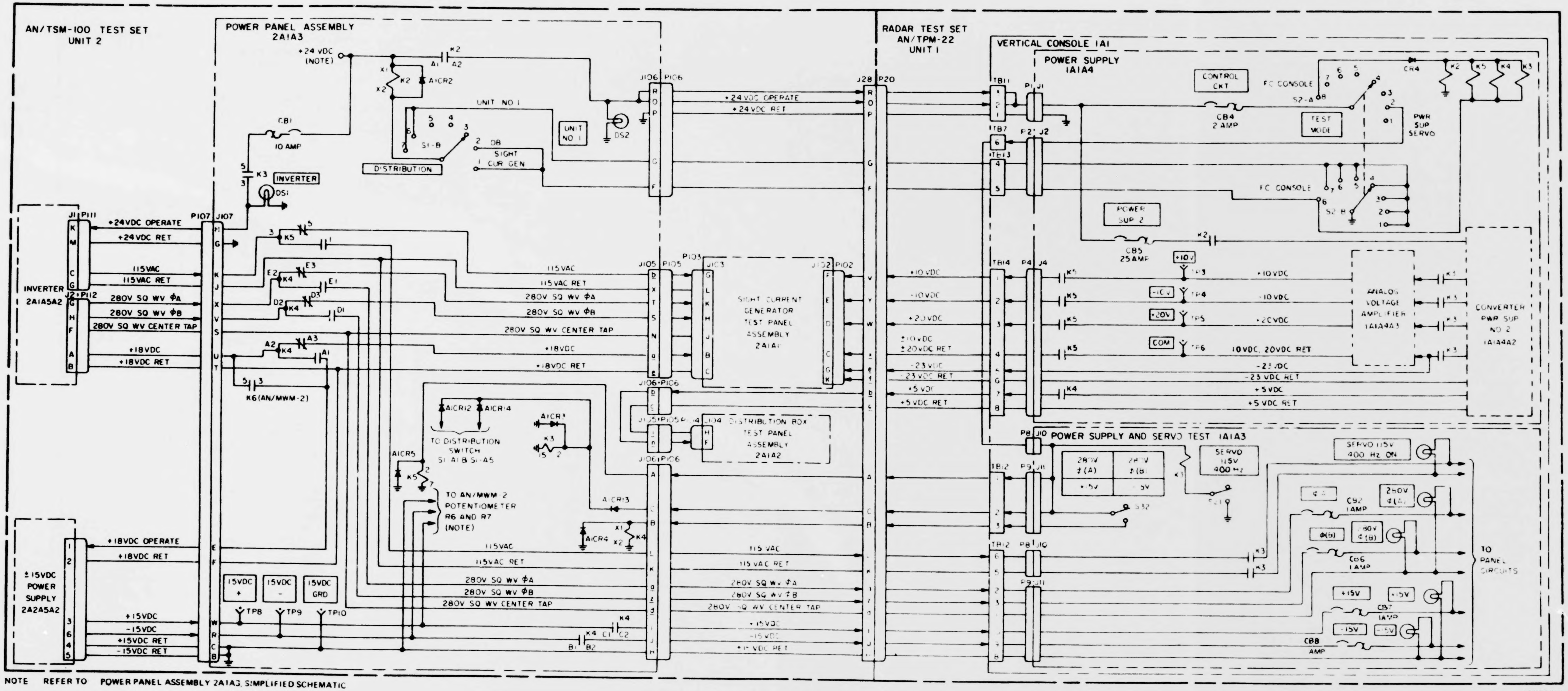
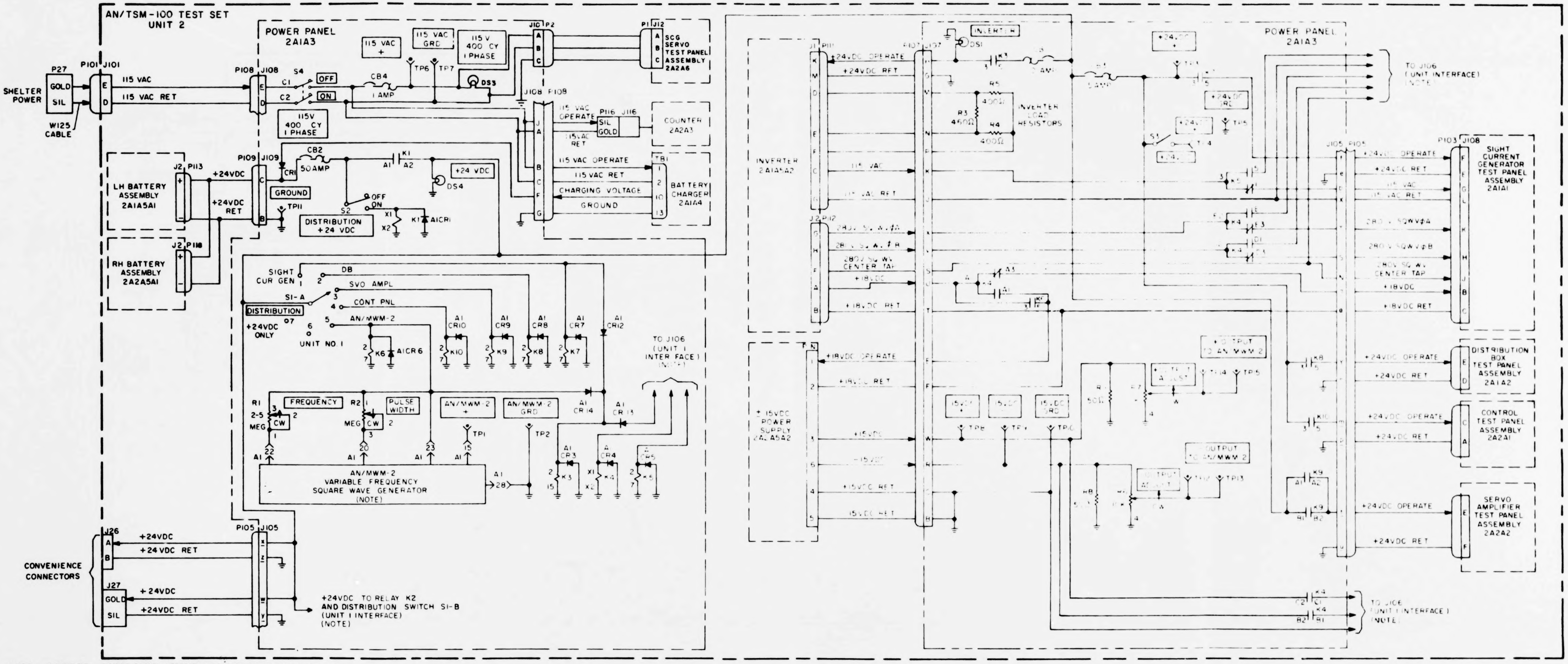

AN/TSM-100 TEST SET
UNIT 2
POWER PANEL ASSEMBLY
2A1A3
RADAR TEST SET
AN/TPM-22
UNIT 1
VERTICAL CONSOLE 1A1
POWER SUPPLY
1A1A4
POWER SUPPLY AND SERVO TEST 1A1A3
INVERTER
2A1A5A2
±15VDC
POWER
SUPPLY
2A2A5A2
+24 VDC
(NOTE)
CB1
10 AMP
K3
INVERTER
DS1
DISTRIBUTION
UNIT NO 1
S1-B
SIGHT
CUR GEN
DS2
+24VDC OPERATE
+24VDC RET
115VAC
115VAC RET
280V SQ WV ΦA
280V SQ WV ΦB
280V SQ WV CENTER TAP
+18VDC
+18VDC RET
K6(AN/MWM-2)
SIGHT CURRENT
GENERATOR
TEST PANEL
ASSEMBLY
2A1A1
DISTRIBUTION BOX
TEST PANEL
ASSEMBLY
2A1A2
TO DISTRIBUTION
SWITCH
S1-A1 & S1-A5
TO AN/MWM-2
POTENTIOMETER
R6 AND R7
(NOTE)
+18VDC OPERATE
+15VDC
-15VDC
+15VDC RET
-15VDC RET
15VDC +
15VDC -
15VDC GRD
TP8
TP9
TP10
P107
J107
J106
P106
J105
P105
J103
J102
P102
J104
J28
P20
TB11
TB7
TB13
TB14
TB12
CONTROL
CKT
FC CONSOLE
S2-A
CB4
2 AMP
TEST
MODE
PWR
SUP
SERVO
S2-B
POWER
SUP 2
CB5
25 AMP
+10VDC
-10VDC
+20VDC
±10VDC
±20VDC RET
-23VDC
-23VDC RET
+5VDC
+5VDC RET
TP3
TP4
TP5
TP6
10VDC, 20VDC RET
ANALOG
VOLTAGE
AMPLIFIER
1A1A4A3
CONVERTER
PWR SUP
NO 2
1A1A4A2
SERVO
115V
400 Hz
SERVO 115V
400 Hz ON
280V
Φ(A)
280V
Φ(B)
+5V
-5V
S32
CB2
1 AMP
CB6
1 AMP
CB7
1 AMP
CB8
1 AMP
TO
PANEL
CIRCUITS
AR905857

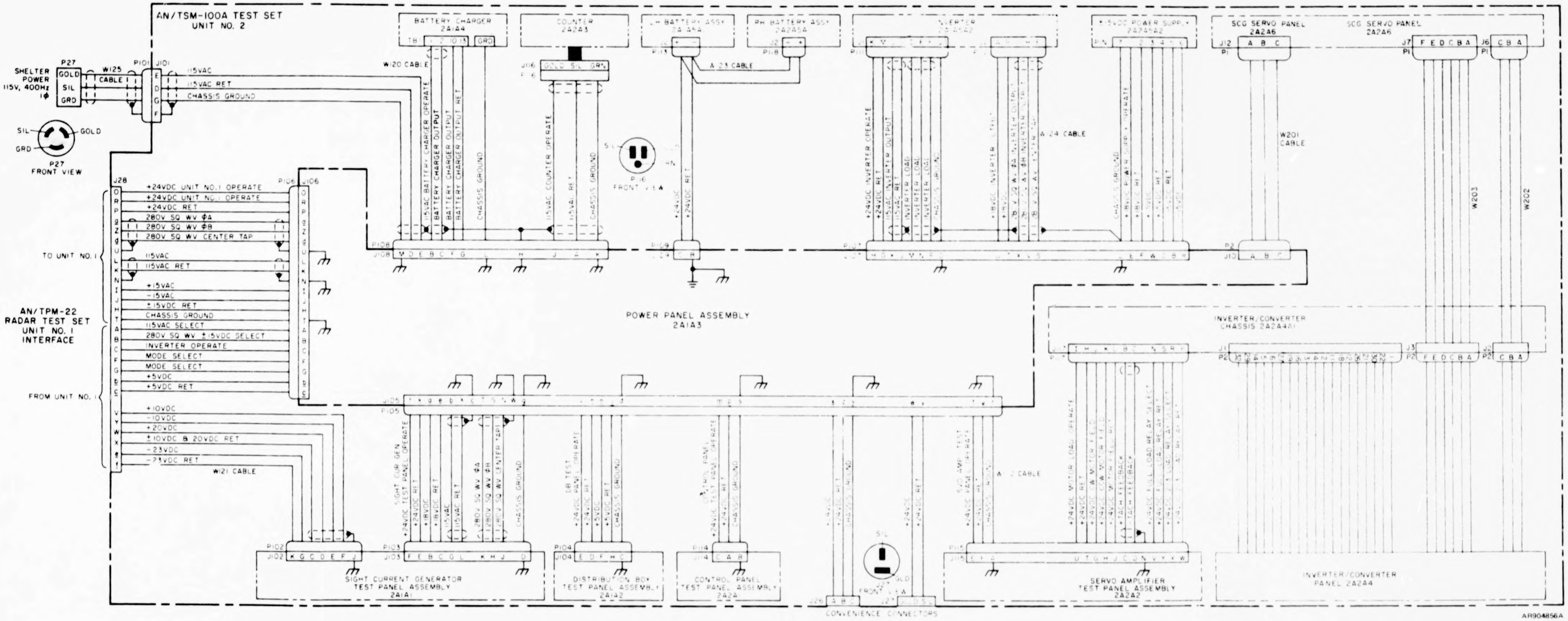
NOTE REFER TO POWER PANEL ASSEMBLY 2A1A3, SIMPLIFIED SCHEMATIC

FO-2. AN/TSM-100 interconnecting schematic diagram.

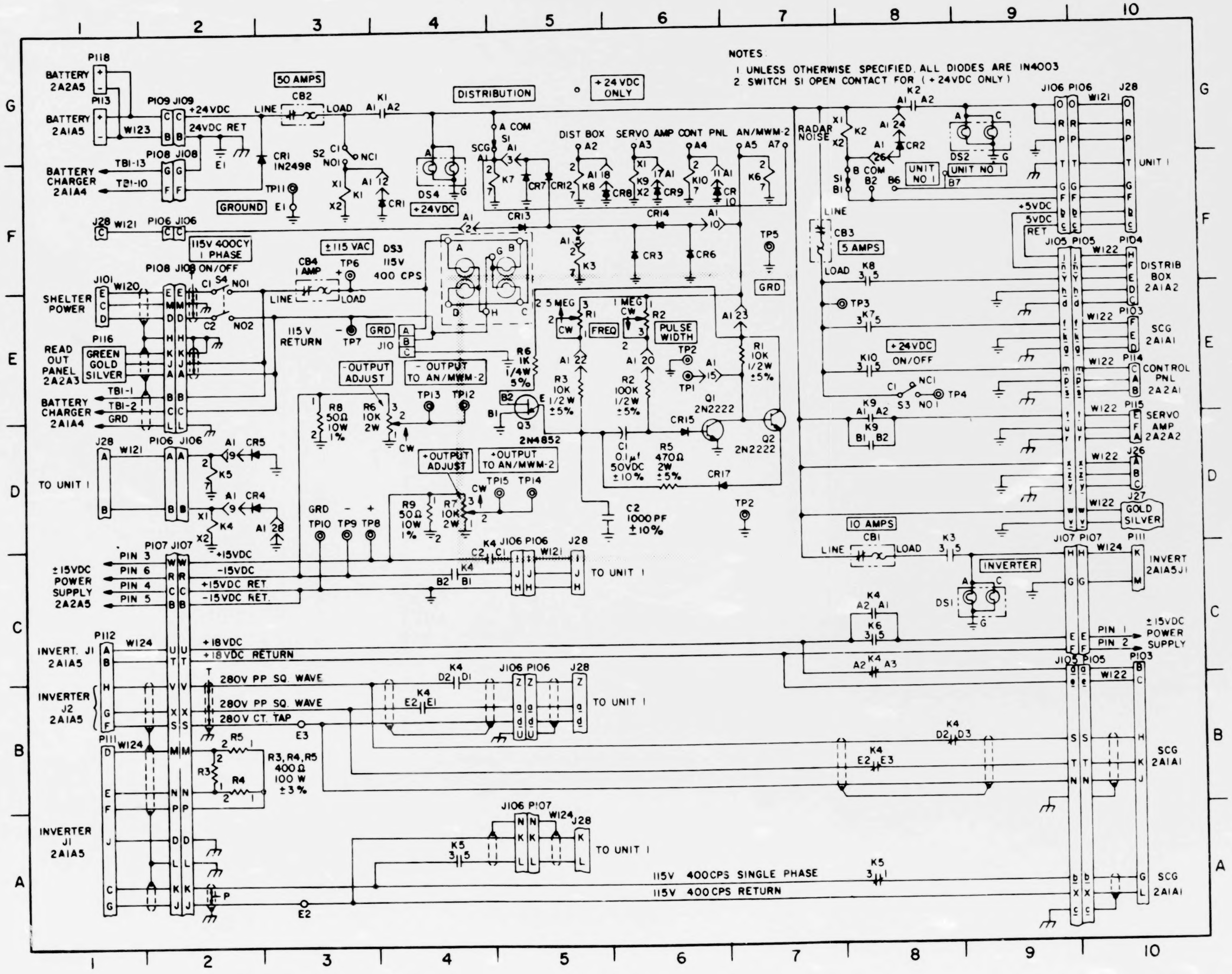

AN/TSM-100 TEST SET
UNIT 2
SHELTER POWER
P27
GOLD
SIL
W125 CABLE
P101 J101
115 VAC
115 VAC RET
POWER PANEL 2A1A3
P108 J108
S4
OFF
ON
C1
C2
CB4
1 AMP
115 VAC +
115 VAC GRD
115 V 400 CY 1 PHASE
TP6
TP7
DS3
J10 P2
P1 J12
SCG SERVO TEST PANEL ASSEMBLY 2A2A6
J108 P108
115 VAC OPERATE
P116 J116
COUNTER 2A2A3
115 VAC RET
115 VAC OPERATE
115 VAC RET
CHARGING VOLTAGE
GROUND
TB1
BATTERY CHARGER 2A1A4
LH BATTERY ASSEMBLY 2A1A5A1
RH BATTERY ASSEMBLY 2A2A5A1
J2 P113
J2 P118
+24VDC
+24VDC RET
P109 J109
CB2
50 AMP
CR1
GROUND
TP11
K1
A1 A2
+24 VDC
DS4
S2
OFF
ON
DISTRIBUTION +24 VDC
A1CR1
SIGHT CUR GEN
DB
SVO AMPL
S1-A
CONT PNL
AN/MWM-2
DISTRIBUTION
+24VDC ONLY
UNIT NO 1
A1 CR10
A1 CR9
A1 CR8
A1 CR7
A1 CR12
K6
A1CR6
K10
K9
K8
K7
TO J106 (UNIT 1 INTER FACE) (NOTE)
R1 2-5 MEG
FREQUENCY
R2 1 MEG
PULSE WIDTH
CW
AN/MWM-2 +
AN/MWM-2 GRD
TP1
TP2
A1 CR14
A1 CR13
A1 CR3
A1 CR4
A1 CR5
K3
K4
K5
AN/MWM-2 VARIABLE FREQUENCY SQUARE WAVE GENERATOR (NOTE)
J26
+24VDC
+24VDC RET
CONVENIENCE CONNECTORS
J27
GOLD
SIL
P105 J105
+24VDC TO RELAY K2 AND DISTRIBUTION SWITCH S1-B (UNIT 1 INTERFACE) (NOTE)
INVERTER
DS1
K3
2 AMP
R5 400Ω
R3 450Ω
R4 400Ω
INVERTER LOAD RESISTORS
J1 P111
P107 J107
+24VDC OPERATE
+24VDC RET
115 VAC
115 VAC RET
INVERTER 2A1A5A2
J2 P112
28OV SQ. W. ØA
28OV SQ. W. ØB
28OV SQ WV CENTER TAP
+18VDC
+18VDC RET
+18VDC OPERATE
+15VDC POWER SUPPLY 2A1A5A2
+15VDC
-15VDC
+15VDC RET
15VDC RET
POWER PANEL 2A1A3
+24VDC +
5 AMP
TP3
+24VDC GRD
TP5
S1
TP4
TO J106 (UNIT INTERFACE) (NOTE)
J105 P105
P103 J108
+24VDC OPERATE
+24VDC RET
115 VAC
115 VAC RET
28OV SQWV ØA
28OV SQWV ØB
28OV SQ WV CENTER TAP
+18VDC
+18VDC RET
SIGHT CURRENT GENERATOR TEST PANEL ASSEMBLY 2A1A1
+15 OUTPUT TO AN/MWM-2
OUTPUT ADJUST
TP14
TP15
R 50Ω
TP8
TP9
TP10
15VDC +
15VDC GRD
DISTRIBUTION BOX TEST PANEL ASSEMBLY 2A1A2
CONTROL TEST PANEL ASSEMBLY 2A2A1
OUTPUT TO AN/MWM-2
OUTPUT ADJUST
TP12
TP13
R8
SERVO AMPLIFIER TEST PANEL ASSEMBLY 2A2A2
K8
K10
K9
K4
K5
TO J106 (UNIT 1 INTERFACE) (NOTE)
AR904858A

NOTE: REFER TO: POWER PANEL ASSEMBLY 2A1A3 AND AN/TPM-22 RADAR TEST SET (UNIT 1) INTERFACE SIMPLIFIED SCHEMATIC

FO-3. Power panel 2A1A3 simplified schematic.


AN/TSM-100A TEST SET UNIT NO. 2
SHELTER POWER 115V, 400Hz 1ϕ
P27
GOLD
SIL
GRD
W125 CABLE
P101
J101
115VAC
115VAC RET
CHASSIS GROUND
P27 FRONT VIEW
BATTERY CHARGER 2A1A4
TB1
W120 CABLE
115VAC BATTERY CHARGER OPERATE
BATTERY CHARGER OUTPUT
BATTERY CHARGER OUTPUT RET
COUNTER 2A2A3
J116
P116
GOLD SIL GRN
115VAC COUNTER OPERATE
115VAC RET
CHASSIS GROUND
P116 FRONT VIEW
LH BATTERY ASSY 2A1A5A
RH BATTERY ASSY 2A2A5A
P113
P118
J2
W123 CABLE
+24VDC
+24VDC RET
P109
J109
INVERTER 2A1A5A2
P111
+24VDC INVERTER OPERATE
+24VDC RET
115VAC INVERTER OUTPUT
115VAC RET
INVERTER LOAD
CHASSIS GROUND
+18VDC INVERTER OUTPUT
280V SQ WV ϕA INVERTER OUTPUT
280V SQ WV ϕB INVERTER OUTPUT
280V SQ WV CENTER TAP
W124 CABLE
±15VDC POWER SUPPLY 2A2A5A2
+18VDC POWER SUPPLY OPERATE
+18VDC RET
+15VDC
±15VDC RET
-15VDC
P107
J107
SCG SERVO PANEL 2A2A6
J12
P1
J7
J6
W201 CABLE
W203
W202
P2
J110
J28
+24VDC UNIT NO.1 OPERATE
+24VDC UNIT NO.1 OPERATE
+24VDC RET
280V SQ WV ϕA
280V SQ WV ϕB
280V SQ WV CENTER TAP
115VAC
115VAC RET
+15VAC
-15VAC
±15VDC RET
CHASSIS GROUND
115VAC SELECT
280V SQ WV ±15VDC SELECT
INVERTER OPERATE
MODE SELECT
MODE SELECT
+5VDC
+5VDC RET
+10VDC
-10VDC
+20VDC
±10VDC & 20VDC RET
-23VDC
-23VDC RET
W121 CABLE
TO UNIT NO. 1
AN/TPM-22 RADAR TEST SET UNIT NO. 1 INTERFACE
FROM UNIT NO. 1
P106
J106
P108
J108
POWER PANEL ASSEMBLY 2A1A3
J105
P105
P102
J102
SIGHT CUR GEN +24VDC TEST PANEL OPERATE
+24VDC RET
+18VDC
+18VDC RET
115VAC
115VAC RET
280V SQ WV ϕA
280V SQ WV ϕB
280V SQ WV CENTER TAP
CHASSIS GROUND
P103
J103
SIGHT CURRENT GENERATOR TEST PANEL ASSEMBLY 2A1A1
DB TEST +24VDC PANEL OPERATE
+24VDC RET
+5VDC
+5VDC RET
CHASSIS GROUND
P104
J104
DISTRIBUTION BOX TEST PANEL ASSEMBLY 2A1A2
CONTROL PANEL +24VDC TEST PANEL OPERATE
+24VDC RET
CHASSIS GROUND
P114
J114
CONTROL PANEL TEST PANEL ASSEMBLY 2A2A1
+24VDC
+24VDC RET
CHASSIS GROUND
SIL
GLD
J27 FRONT VIEW
J26
J27
CONVENIENCE CONNECTORS
SVO AMP TEST +24VDC PANEL OPERATE
+24VDC RET
CHASSIS GROUND
W122 CABLE
P115
J115
+24VDC MOTOR LOAD OPERATE
+24VDC RET
+24VDC CW MOTOR FIELD
+24VDC CCW MOTOR FIELD
+24VDC MOTOR FIELD RET
+TACH FEEDBACK
-TACH FEEDBACK
+24VDC FULL LOAD RELAY SELECT
+24VDC FULL LOAD RELAY RET
SERVO AMPLIFIER TEST PANEL ASSEMBLY 2A2A2
INVERTER/CONVERTER CHASSIS 2A2A4A1
J117
P117
J1
P2
J3
J2
INVERTER/CONVERTER PANEL 2A2A4
AR904856A

FO-4. Power panel 2A1A3 and AN/TPM-22 radar test set unit 1 simplified interface schematic.


NOTES:
1 UNLESS OTHERWISE SPECIFIED, ALL DIODES ARE IN4003
2 SWITCH S1 OPEN CONTACT FOR (+24VDC ONLY)
BATTERY 2A2A5
BATTERY 2A1A5
BATTERY CHARGER 2A1A4
SHELTER POWER
READ OUT PANEL 2A2A3
TO UNIT 1
±15VDC POWER SUPPLY 2A2A5
INVERT. J1 2A1A5
INVERTER J2 2A1A5
INVERTER J1 2A1A5
50 AMPS
DISTRIBUTION
+24VDC ONLY
GROUND
115V 400CY 1 PHASE
±115 VAC
-OUTPUT ADJUST
-OUTPUT TO AN/MWM-2
+OUTPUT ADJUST
+OUTPUT TO AN/MWM-2
FREQ
PULSE WIDTH
DIST BOX
SERVO AMP
CONT PNL
AN/MWM-2
RADAR NOISE
UNIT NO 1
5 AMPS
GRD
+24VDC ON/OFF
10 AMPS
INVERTER
DISTRIB BOX 2A1A2
SCG 2A1A1
CONTROL PNL 2A2A1
SERVO AMP 2A2A2
GOLD SILVER
INVERT 2A1A5J1
±15VDC POWER SUPPLY
280V PP SQ. WAVE
280V CT. TAP
R3, R4, R5 400Ω 100 W ±3%
115V 400CPS SINGLE PHASE
115V 400CPS RETURN
+18VDC
+18VDC RETURN
+15VDC
-15VDC
+15VDC RET
-15VDC RET.

ARR82-28635

Figure FO-5. Power panel 2A1A3, detailed schematic (sheet 1 of 2).

Change 1

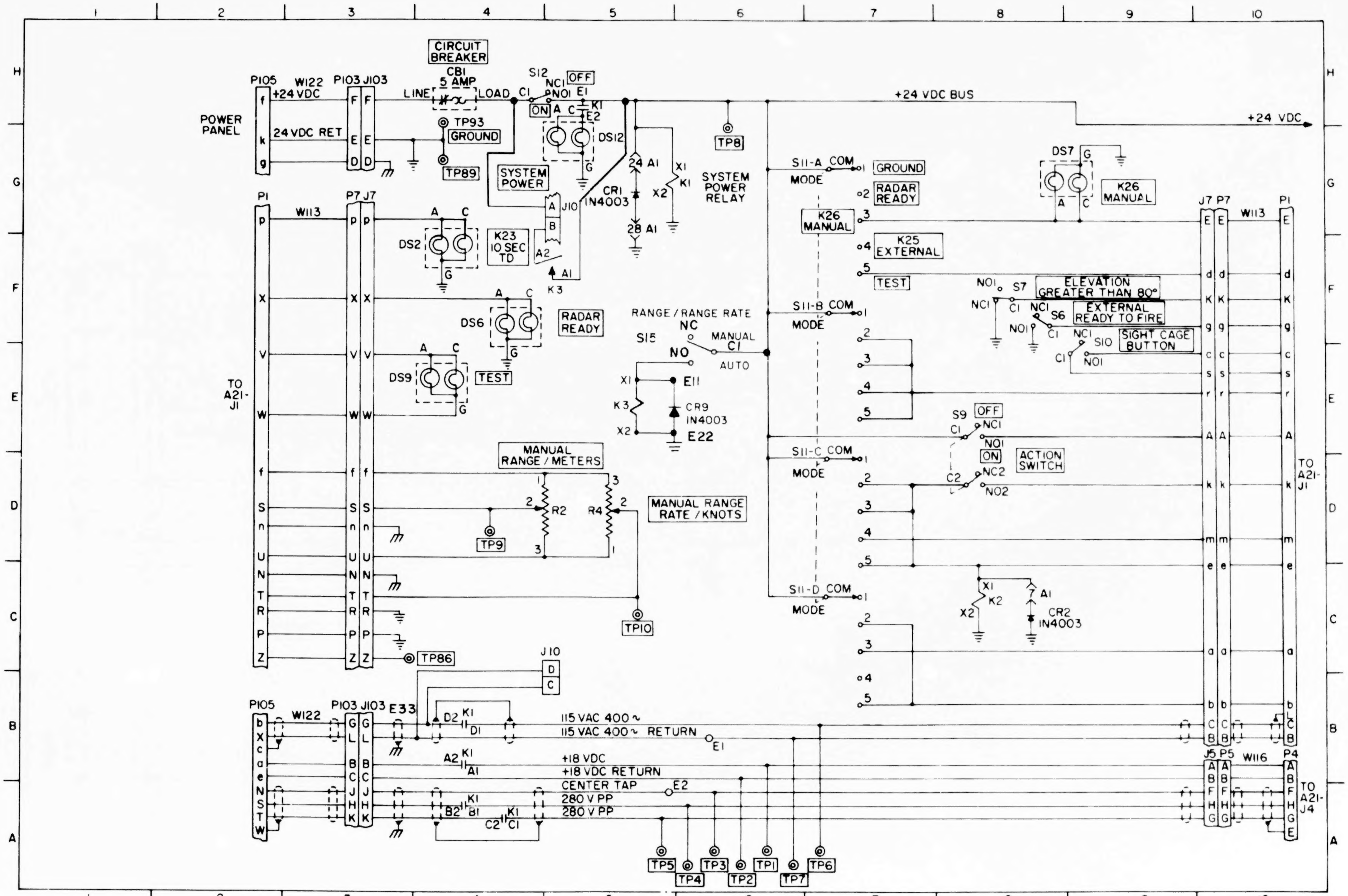
REF DESIG.	ZONE	REF DESIG.	ZONE	REF DESIG.	ZONE	REF DESIG.	ZONE	REF DESIG.	ZONE
A1C1	D-6			DS2	G-9	R1	E-5	TP3	E-8
A1C 2	D-5	A1CR17	D-6	DS3	F-4, F-5	R2	E-6	TP4	E-8
A1CR1	F-4	A1Q1	D-6	DS4	F-4	R3	B-2	TP5	F-7
A1CR2	G-8	A1Q2	D-7	K1	F-3, G-4	R4	B-2	TP6	F-3
A1CR3	F-6	A1Q3	E-5	K2	G-8	R5	B-2	TP7	E-3
A1CR4	D-2	A1R1	E-7	K3	F-5, C-8	R6	E-4	TP8	D-3
A1CR5	D-2	A1R2	E-6	K4	D-2, C-8	R7	D-4	TP9	D-3
A1CR6	F-6	A1R3	E-5		B-8, B-4	R8	E-3	TP10	D-3
A1CR7	F-5	A1R5	D-6		C-4 C-8	R9	D-4	TP11	F-3
A1CR8	F-6	A1R6	E-5	K5	D-2,A-4,A-8,	S1	F-8	TP12	E-4
A1CR9	F-6	CB1	C-8	K6	F-7, B-8	S2	G-3	TP13	E-4
A1CR10	F-6	CB2	G-3	K7	F-5, E-8	S3	E-8	TP14	D-5
A1CR12	F-5	CB3	F-7	K8	F-5, F-8	S4	E-2	TP15	D-5
A1CR13	F-5	CB4	F-3	K9	F-6, D-8	TP1	E-6		
A1CR14	F-6	CR1	G-2	K10	F-6, E-8	TP2	D-7, E-6		
A1CR15	D-6	DS1	C-9						

NOTE:

REFERENCE DESIGNATIONS SHOWN ARE ABBREVIATED:
FOR COMPLETE DESIGNATION PREFIX WITH 2A1A3

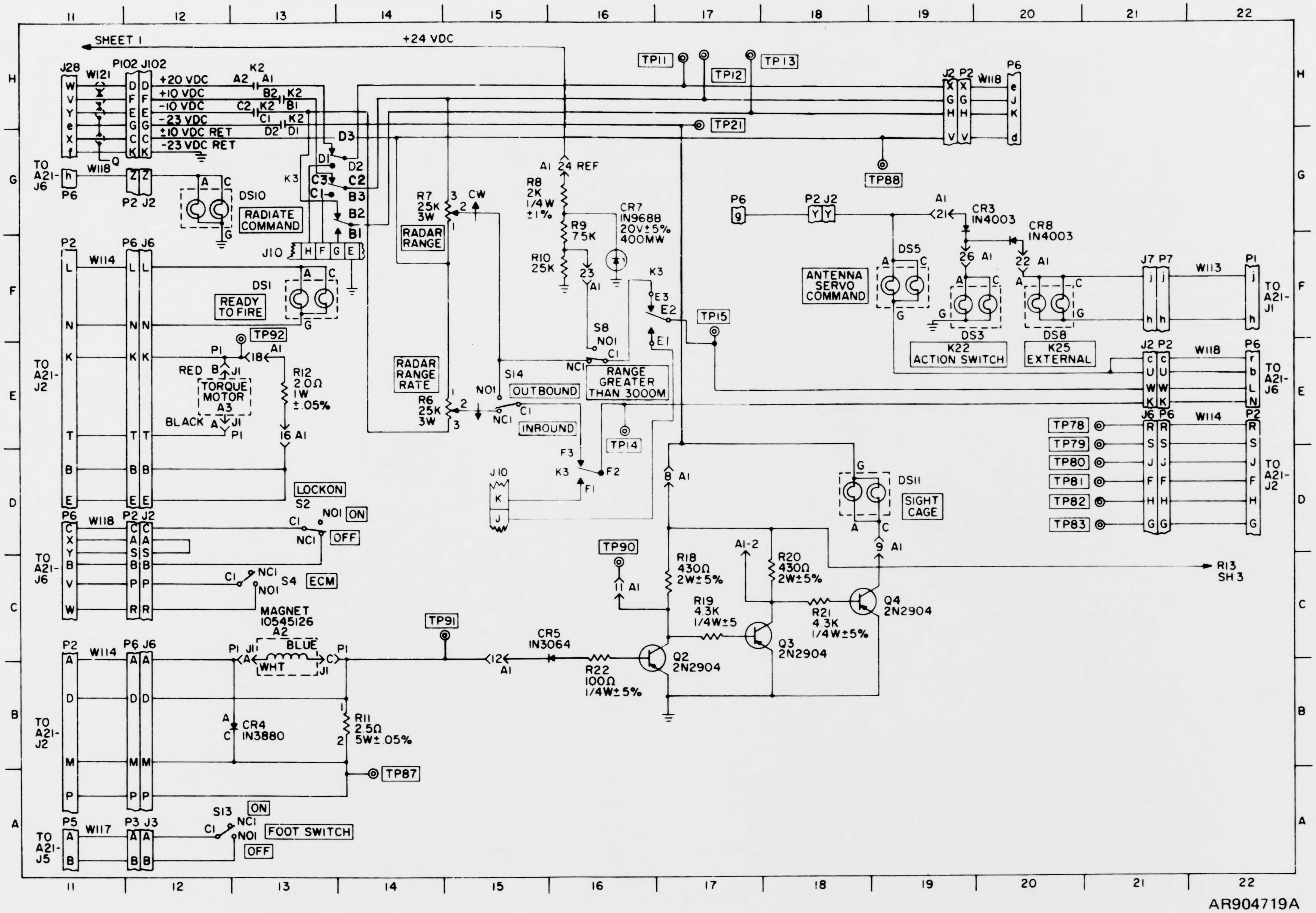
ARR82-28636

Figure FO-5. Power panel 2A1A3, detailed schematic (sheet 2 of 2).

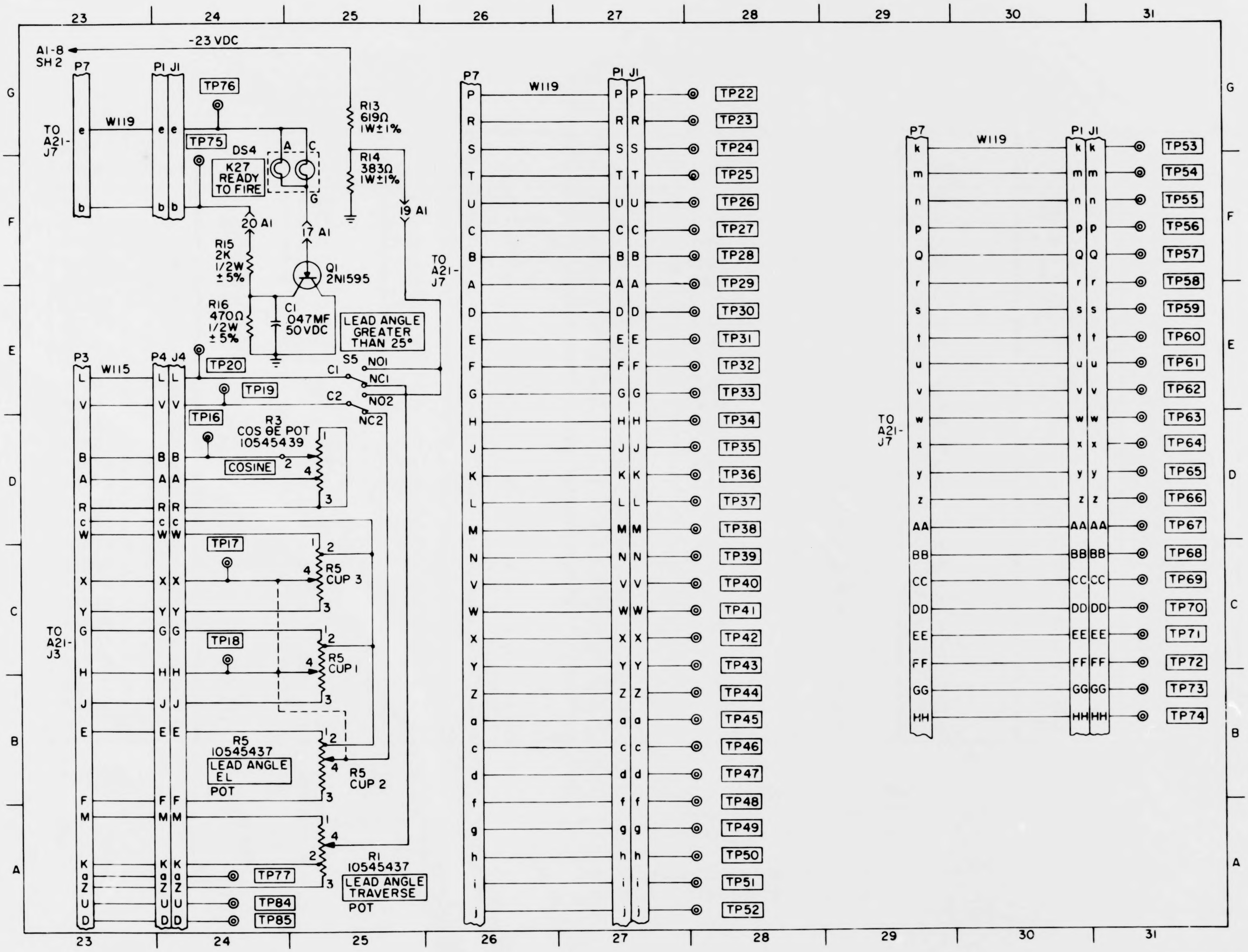

CIRCUIT BREAKER
CB1
5 AMP
LINE
LOAD
S12
C1
NC1
NO1
OFF
ON
E1
E2
K1
A
C
DS12
G
P105
W122
+24 VDC
P103 J103
POWER PANEL
24 VDC RET
TP93
GROUND
TP89
SYSTEM POWER
J10
B
A2
A1
K3
K23
10 SEC TD
24 A1
CR1
1N4003
28 A1
X1
K1
X2
SYSTEM POWER RELAY
TP8
+24 VDC BUS
+24 VDC
S11-A COM
MODE
GROUND
RADAR READY
K26 MANUAL
K25 EXTERNAL
TEST
DS7
K26 MANUAL
P1
W113
P7 J7
DS2
DS6
RADAR READY
DS9
TEST
TO A21-J1
S11-B COM
MODE
RANGE / RANGE RATE
S15
NC
NO
MANUAL
AUTO
E11
K3
CR9
1N4003
E22
S7
ELEVATION GREATER THAN 80°
S6
EXTERNAL READY TO FIRE
S10
SIGHT CAGE BUTTON
S9
ACTION SWITCH
NO2
NC2
C2
MANUAL RANGE / METERS
R2
R4
MANUAL RANGE RATE / KNOTS
TP9
TP10
S11-C COM
MODE
S11-D COM
MODE
K2
CR2
1N4003
TP86
J10
D
C
E33
D2
D1
115 VAC 400~
115 VAC 400~ RETURN
+18 VDC
+18 VDC RETURN
CENTER TAP
280 V PP
280 V PP
B2
B1
C2
C1
J5 P5
W116
P4
TO A21-J4
TP5
TP4
TP3
TP2
TP1
TP7
TP6
1
2
3
4
5
6
7
8
9
10
H
G
F
E
D
C
B
A

AR904718A

FO-6. Sight current generator panel 2A1A1, detailed schematic (sheet 1 of 4).


SHEET 1
+24 VDC
J28
W121
P102 J102
+20 VDC
+10 VDC
-10 VDC
-23 VDC
±10 VDC RET
-23 VDC RET
K2
A2 A1
B2 B1
C2 C1
D2 D1
D3
K3
TO A21-J6
P6
W118
P2 J2
DS10
RADIATE COMMAND
J10
R7 25K 3W
CW
RADAR RANGE
TP11
TP12
TP13
TP21
TP88
A1 24 REF
R8 2K 1/4W ±1%
R9 7.5K
R10 25K
CR7 1N968B 20V±5% 400MW
23 A1
K3
E3
E2
E1
TP15
S8
NO1
NC1
C1
RANGE GREATER THAN 3000M
TP14
P2 J2
W118
P6
TO A21-J6
P6 J6
W114
TO A21-J2
DS1
READY TO FIRE
TP92
P1
18
A1
RED
B J1
TORQUE MOTOR A3
BLACK
A J1
R12 2.0Ω 1W ±.05%
16 A1
RADAR RANGE RATE
R6 25K 3W
S14
NO1
OUTBOUND
NC1
C1
INBOUND
F3
K3
F2
F1
J10
K
J
LOCKON
S2
ON
OFF
S4
ECM
TO A21-J6
MAGNET 10545126
A2
BLUE
WHT
J1
CR4 1N3880
R11 2.5Ω 5W±.05%
TP87
TO A21-J2
S13
ON
FOOT SWITCH
OFF
P5
W117
P3 J3
TO A21-J5
TP91
12 A1
CR5 1N3064
R22 100Ω 1/4W±5%
Q2 2N2904
TP90
11 A1
R18 430Ω 2W±5%
8 A1
R19 4.3K 1/4W±5
A1-2
Q3 2N2904
R20 430Ω 2W±5%
R21 4.3K 1/4W±5%
Q4 2N2904
9 A1
DS11
SIGHT CAGE
R13 SH 3
P6
P2 J2
A1
21
CR3 1N4003
CR8 1N4003
26 A1
22 A1
DS5
ANTENNA SERVO COMMAND
DS3
K22 ACTION SWITCH
DS8
K25 EXTERNAL
J7 P7
W113
P1
TO A21-J1
J2 P2
W118
P6
TO A21-J6
J6 P6
W114
P2
TO A21-J2
TP78
TP79
TP80
TP81
TP82
TP83
J2 P2
W118
P6
11
12
13
14
15
16
17
18
19
20
21
22
H
G
F
E
D
C
B
A
AR904719A

FO-6. Sight current generator panel 2A1A1, detailed schematic (sheet 2 of 4).


23
24
25
26
27
28
29
30
31
G
F
E
D
C
B
A
-23 VDC
A1-8
SH 2
P7
P1 J1
TO
A21-
J7
W119
TP76
TP75
DS4
K27
READY
TO FIRE
A
C
G
R13
619Ω
1W±1%
R14
383Ω
1W±1%
19 A1
20 A1
17 A1
R15
2K
1/2W
±5%
Q1
2N1595
R16
470Ω
1/2W
±5%
C1
.047MF
50VDC
LEAD ANGLE
GREATER
THAN 25°
TP20
S5
C1
NO1
NC1
C2
NO2
NC2
TP19
TP16
R3
COS θE POT
10545439
COSINE
P3
W115
P4 J4
TO
A21-
J3
TP17
R5
CUP 3
TP18
R5
CUP 1
R5
10545437
LEAD ANGLE
EL
POT
R5
CUP 2
R1
10545437
LEAD ANGLE
TRAVERSE
POT
TP77
TP84
TP85
TP22
TP23
TP24
TP25
TP26
TP27
TP28
TP29
TP30
TP31
TP32
TP33
TP34
TP35
TP36
TP37
TP38
TP39
TP40
TP41
TP42
TP43
TP44
TP45
TP46
TP47
TP48
TP49
TP50
TP51
TP52
TP53
TP54
TP55
TP56
TP57
TP58
TP59
TP60
TP61
TP62
TP63
TP64
TP65
TP66
TP67
TP68
TP69
TP70
TP71
TP72
TP73
TP74

AR904720

FO-6. Sight current generator panel 2A1A1, detailed schematic (sheet 3 of 4).

REF DESIG.	ZONE	REF DESIG.	ZONE	REF DESIG.	ZONE	REF DESIG.	ZONE	REF DESIG.	ZONE	REF DESIG.	ZONE
A1C1	E-24	CB1	H-4	R11	B-14	TP13	H-17	TP40	C-28	TP67	D-31
A1CR1	G-5	CR4	B-13	S2	D-13	TP14	E-16	TP41	C-28	TP68	C-31
A1CR2	C-8	CR9	E-5	S4	C-13	TP15	F-17	TP42	C-28	TP69	C-31
A1CR3	G-19	DS1	F-13	S5	E-25	TP16	D-24	TP43	C-28	TP70	C-31
A1CR5	C-16	DS2	F-4	S6	F-8	TP17	C-24	TP44	B-28	TP71	C-31
A1CR7	F-16	DS3	F-19	S7	F-8	TP18	C-24	TP45	B-28	TP72	C-31
A1CR8	F-20	DS4	F-25	S8	E-16	TP19	E-24	TP46	B-28	TP73	B-31
A1Q1	F-25	DS5	F-19	S9	D-8, E-8	TP20	E-24	TP47	B-28	TP74	B-31
A1Q2	C-17	DS6	F4	S10	E-9	TP21	H-17	TP48	B-28	TP75	F-24
A1Q3	C-18	DS7	G-8	S11	B-7, C-7,	TP22	G-28	TP49	A-28	TP76	G-24
A1Q4	C-19	DS8	F-20		D-7, E-7,	TP23	G-28	TP50	A-28	TP77	A-24
A1R8	G-16	DS9	E-4		F-7, G-7	TP24	G-28	TP51	A-28	TP78	E-21
A1R9	G-16	DS10	G-12	S12	H-4	TP25	F-28	TP52	A-28	TP79	E-21
A1R10	F-16	DS11	D-19	S13	A-12	TP26	F-28	TP53	G-31	TP80	D-21
A1R12	E-13	DS12	G-5	S14	E-15	TP27	F-28	TP54	F-31	TP81	D-21
A1R13	G-25	K1	G-5, B-4,	TP1	A-6	TP28	F-28	TP55	F-31	TP82	D-21
A1R14	F-25		A-4, H-5	TP2	A-6	TP29	F-28	TP56	F-31	TP83	D-21
A1R15	F-24	K2	C-8, H-13	TP3	A-6	TP30	E-28	TP57	F-31	TP84	A-24
A1R16	E-24	K3	D-16,F-5	TP4	A-6	TP31	E-28	TP58	E-31	TP85	A-24
A1R18	C-17		F-16,G-13,H-5	TP5	A-5	TP32	E-28	TP59	E-31	TP86	C-4
A1R19	C-17	R1	A-25	TP6	A-7	TP33	E-28	TP60	E-31	TP87	A-14
A1R20	C-18	R2	D-5	TP7	A-6	TP34	D-28	TP61	E-31	TP88	G-19
A1R21	C-18	R3	D-25	TP8	G-6	TP35	D-28	TP62	E-31	TP89	G-4
A1R22	B-16	R4	D-5	TP9	D-4	TP36	D-28	TP63	D-31	TP90	C-16
A2	C-13	R5	C-25, B-25	TP10	C-5	TP37	D-28	TP64	D-31	TP91	C-15
A3	E-12,	R6	E-15	TP11	H-17	TP38	D-28	TP65	D-31	TP92	F-13
	E-13	R7	G-15	TP12	H-17	TP39	C-28	TP66	D-31	TP93	G-4

SHEET NO.	ZONE
1	1 THRU 10
2	11 THRU 22
3	23 THRU 31

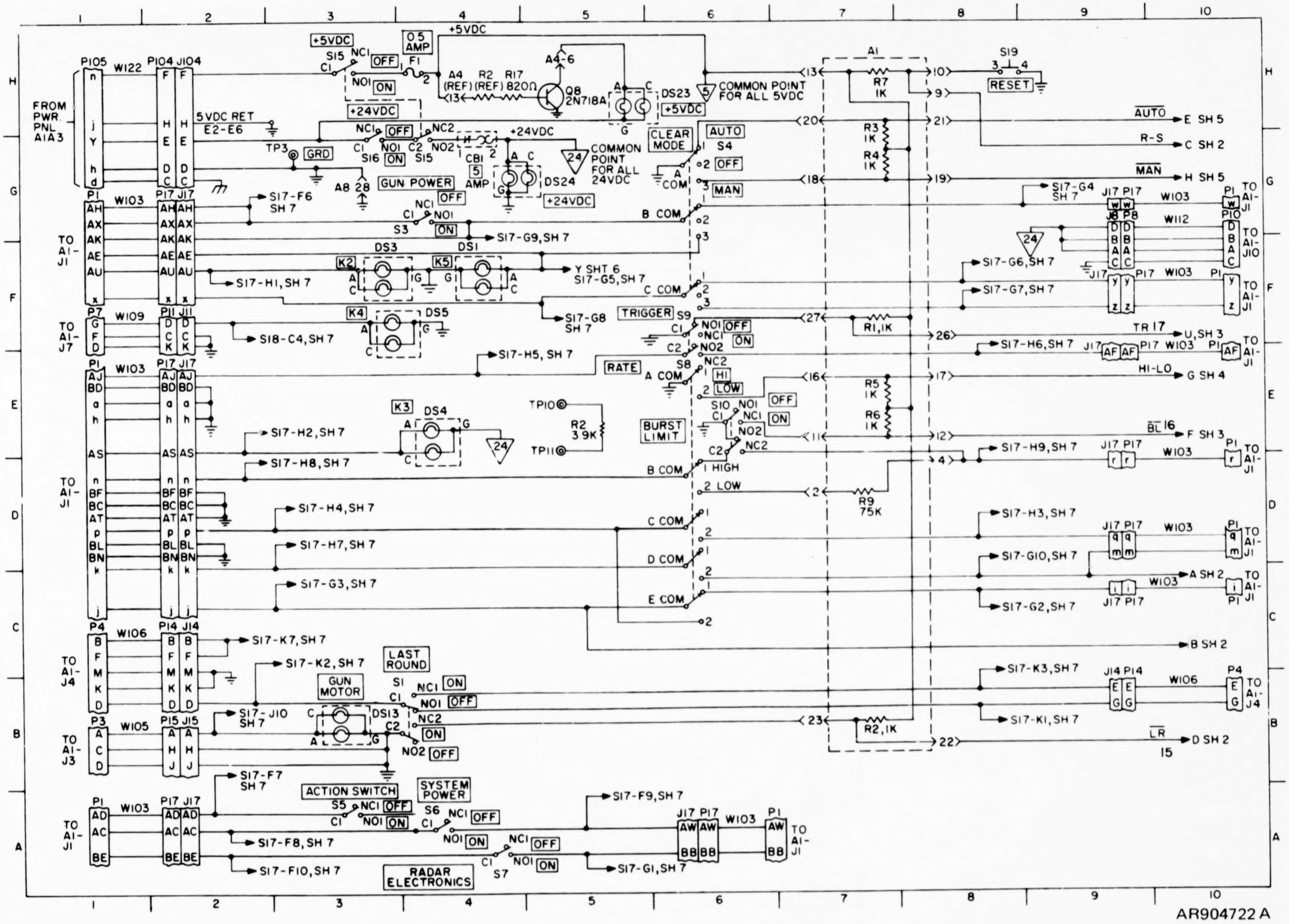
NOTES:

1. REFERENCE DESIGNATIONS SHOWN ARE ABBREVIATED, FOR COMPLETE DESIGNATION PREFIX WITH 2A1A1.

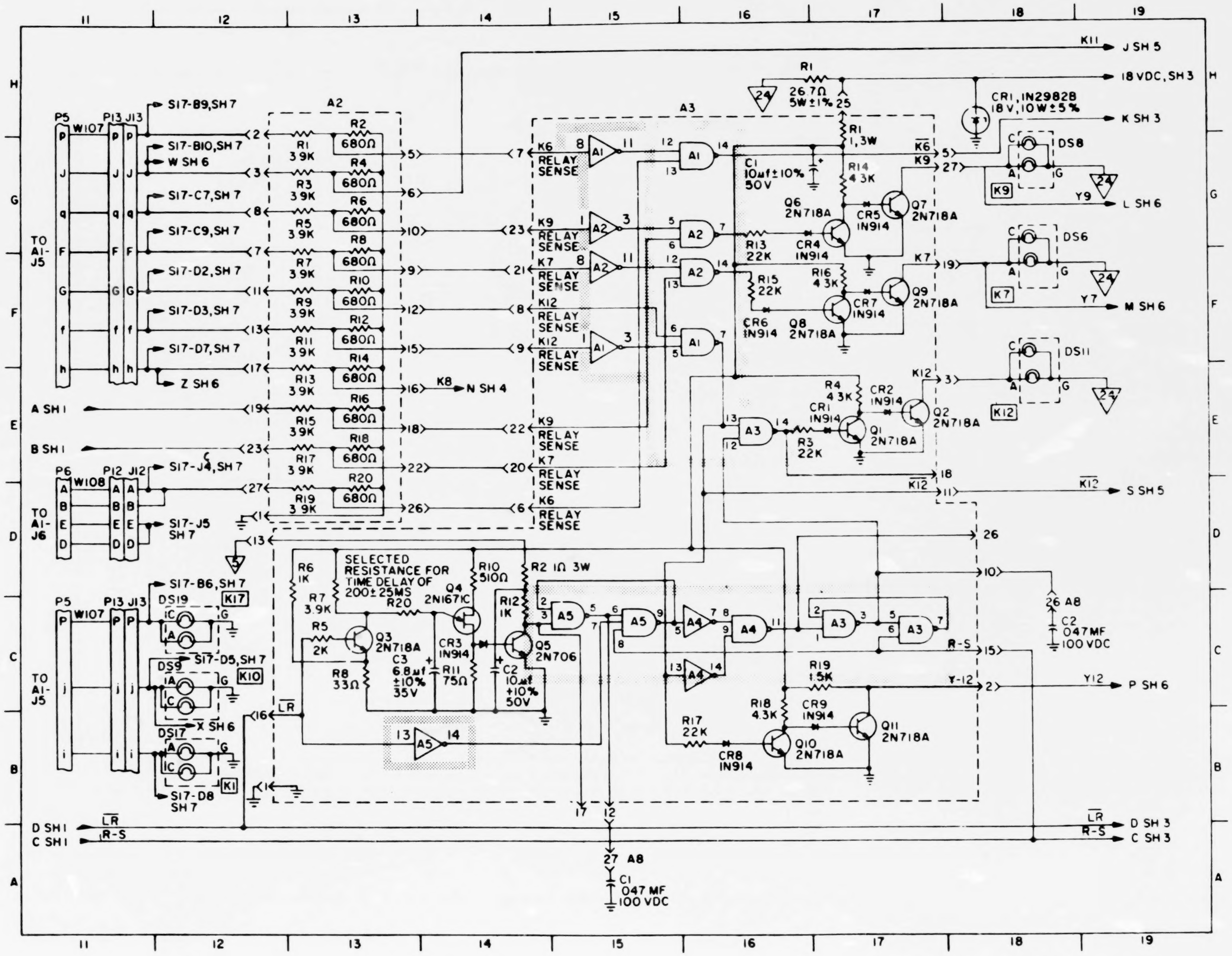
2. ALL RESISTORS ARE 1/8W ± 1% UNLESS OTHERWISE SPECIFIED

AR904839A

FO-6. Sight current generator panel 2A1A1, detailed schematic (sheet 4 of 4).


1
2
3
4
5
6
7
8
9
10
H
G
F
E
D
C
B
A
FROM PWR. PNL A1A3
P105
W122
P104 J104
+5VDC
S15 NC1
C1
NO1
OFF
ON
0.5 AMP
F1
+5VDC
A4-6
A4 (REF)
R2 (REF)
R17 820Ω
Q8 2N718A
A4-13
DS23
+5VDC
COMMON POINT FOR ALL 5VDC
5VDC RET E2-E6
+24VDC
TP3
GRD
NC1 OFF NC2
C1 NO1 C2 NO2
S16 ON S15
CB1 5 AMP
+24VDC
DS24
+24VDC
COMMON POINT FOR ALL 24VDC
A8 28
GUN POWER
CLEAR MODE
AUTO
S4
OFF
MAN
A COM
B COM
C COM
A1
13
10
9
20
21
18
19
27
26
16
17
11
12
4
2
23
22
R7 1K
R3 1K
R4 1K
R1, 1K
R5 1K
R6 1K
R9 75K
R2, 1K
S19
RESET
AUTO E SH 5
R-S C SH 2
MAN H SH 5
S17-G4 SH 7
J17 P17 W103 P1 TO A1-J1
J8 P8 W112 P10 TO A1-J10
S17-G6, SH 7
S17-G7, SH 7
TR 17 U, SH 3
S17-H6, SH 7
HI-LO G SH 4
BL 16 F SH 3
S17-H9, SH 7
S17-H3, SH 7
S17-G10, SH 7
A SH 2
S17-G2, SH 7
B SH 2
S17-K3, SH 7
J14 P14 W106 P4 TO A1-J4
S17-K1, SH 7
LR D SH 2
15
P1 W103 P17 J17 TO A1-J1
S17-F6 SH 7
S3 NC1 NO1 C1 OFF ON
S17-G9, SH 7
K2 DS3 K5 DS1
Y SHT 6 S17-G5, SH 7
S17-H1, SH 7
P7 W109 P11 J11 TO A1-J7
K4 DS5
S18-C4, SH 7
S17-G8 SH 7
TRIGGER S9
NO1 OFF NC1 ON NC2 NO2
S17-H5, SH 7
RATE
S8
HI
LOW
A COM
TP10
R2 3.9K
TP11
K3 DS4
S17-H2, SH 7
S17-H8, SH 7
BURST LIMIT
S10
1 HIGH
2 LOW
S17-H4, SH 7
S17-H7, SH 7
S17-G3, SH 7
D COM
E COM
P4 W106 P14 J14 TO A1-J4
S17-K7, SH 7
S17-K2, SH 7
LAST ROUND
S1
GUN MOTOR
DS13
P3 W105 P15 J15 TO A1-J3
S17-J10 SH 7
S17-F7 SH 7
ACTION SWITCH
S5
SYSTEM POWER
S6
S17-F8, SH 7
S17-F10, SH 7
RADAR ELECTRONICS
S7
S17-F9, SH 7
S17-G1, SH 7
J17 P17 W103 P1 AW BB TO A1-J1
AR904722 A

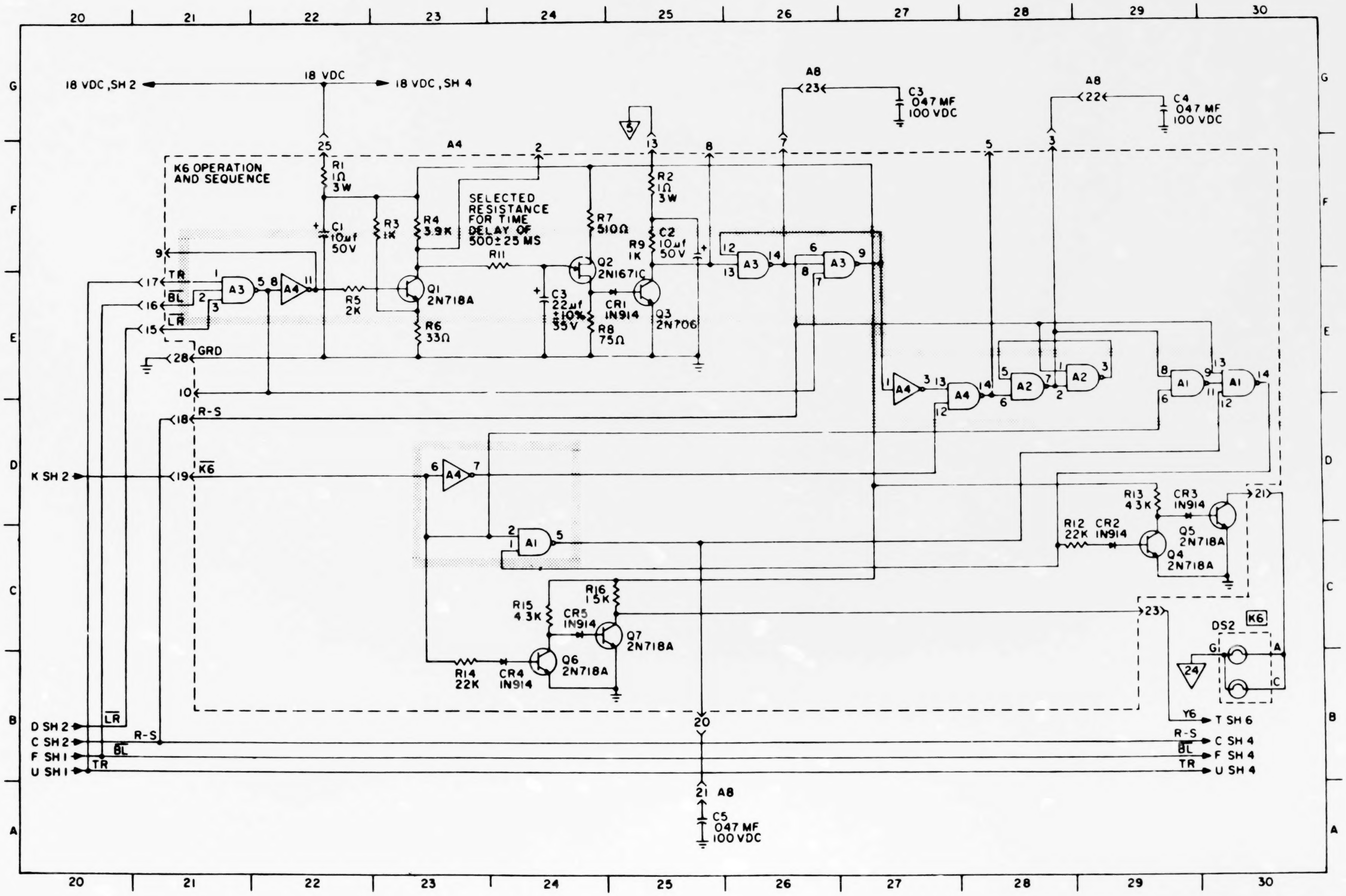
FO-7. Distribution box panel 2A1A2, detailed schematic (sheet 1 of 8).


11
12
13
14
15
16
17
18
19
H
G
F
E
D
C
B
A
K11
J SH 5
18 VDC, SH 3
K SH 3
L SH 6
M SH 6
S SH 5
P SH 6
D SH 3
C SH 3
N SH 4
Z SH 6
W SH 6
X SH 6
A SH 1
B SH 1
D SH 1
C SH 1
TO A1-J5
TO A1-J6
P5
P6
P12
P13
J12
J13
W107
W108
S17-B9, SH 7
S17-B10, SH 7
S17-C7, SH 7
S17-C9, SH 7
S17-D2, SH 7
S17-D3, SH 7
S17-D7, SH 7
S17-J4, SH 7
S17-J5 SH 7
S17-B6, SH 7
S17-D5, SH 7
S17-D8 SH 7
A2
A3
A8
R1 3.9K
R2 680Ω
R3 3.9K
R4 680Ω
R5 3.9K
R6 680Ω
R7 3.9K
R8 680Ω
R9 3.9K
R10 680Ω
R11 3.9K
R12 680Ω
R13 3.9K
R14 680Ω
R15 3.9K
R16 680Ω
R17 3.9K
R18 680Ω
R19 3.9K
R20 680Ω
K6 RELAY SENSE
K9 RELAY SENSE
K7 RELAY SENSE
K12 RELAY SENSE
R1 26.7Ω 5W±1%
R1 1, 3W
C1 10µf±10% 50V
R14 4.3K
R13 22K
R15 22K
R16 4.3K
CR4 IN914
CR5 IN914
CR6 IN914
CR7 IN914
Q6 2N718A
Q7 2N718A
Q8 2N718A
Q9 2N718A
CR1, IN2982B 18V, 10W±5%
DS8
DS6
DS11
K9
K7
K12
Y9
Y7
R4 4.3K
CR2 IN914
CR1 IN914
R3 22K
Q1 2N718A
Q2 2N718A
K12
SELECTED RESISTANCE FOR TIME DELAY OF 200±25MS
R6 1K
R7 3.9K
R20
R5 2K
R8 33Ω
Q3 2N718A
C3 6.8µf ±10% 35V
R10 510Ω
Q4 2N1671C
CR3 IN914
R11 75Ω
R12 1K
R2 1Ω 3W
Q5 2N706
C2 10µf ±10% 50V
A5
A4
R-S
Y-12
Y12
R19 1.5K
R18 4.3K
CR9 IN914
Q11 2N718A
R17 22K
CR8 IN914
Q10 2N718A
C2 .047MF 100 VDC
C1 .047 MF 100 VDC
LR
DS19
DS9
DS17
K17
K10
K1
24

ARR82-28637

Figure FO-7. Distribution box panel 2A1A2, detailed schematic (sheet 2 of 8).

Change 1


18 VDC, SH 2
18 VDC
18 VDC, SH 4
K6 OPERATION AND SEQUENCE
SELECTED RESISTANCE FOR TIME DELAY OF 500±25 MS
R1 1Ω 3W
C1 10μf 50V
R3 1K
R4 3.9K
Q1 2N718A
R5 2K
R6 33Ω
R11
C3 22μf ±10% 35V
R7 510Ω
Q2 2N1671C
CR1 1N914
R8 75Ω
R9 1K
R2 1Ω 3W
C2 10μf 50V
Q3 2N706
A8
C3 .047 MF 100 VDC
C4 .047 MF 100 VDC
C5 .047 MF 100 VDC
GRD
R-S
K6
TR
BL
LR
K SH 2
D SH 2
C SH 2
F SH 1
U SH 1
R13 4.3K
CR3 1N914
Q5 2N718A
R12 22K
CR2 1N914
Q4 2N718A
R15 4.3K
R16 1.5K
CR5 1N914
Q7 2N718A
R14 22K
CR4 1N914
Q6 2N718A
DS2
K6
Y6
T SH 6
C SH 4
F SH 4
U SH 4
A1
A2
A3
A4

ARR82-28638

Figure FO-7. Distribution box panel 2A1A2, detailed schematic (sheet 3 of 8).

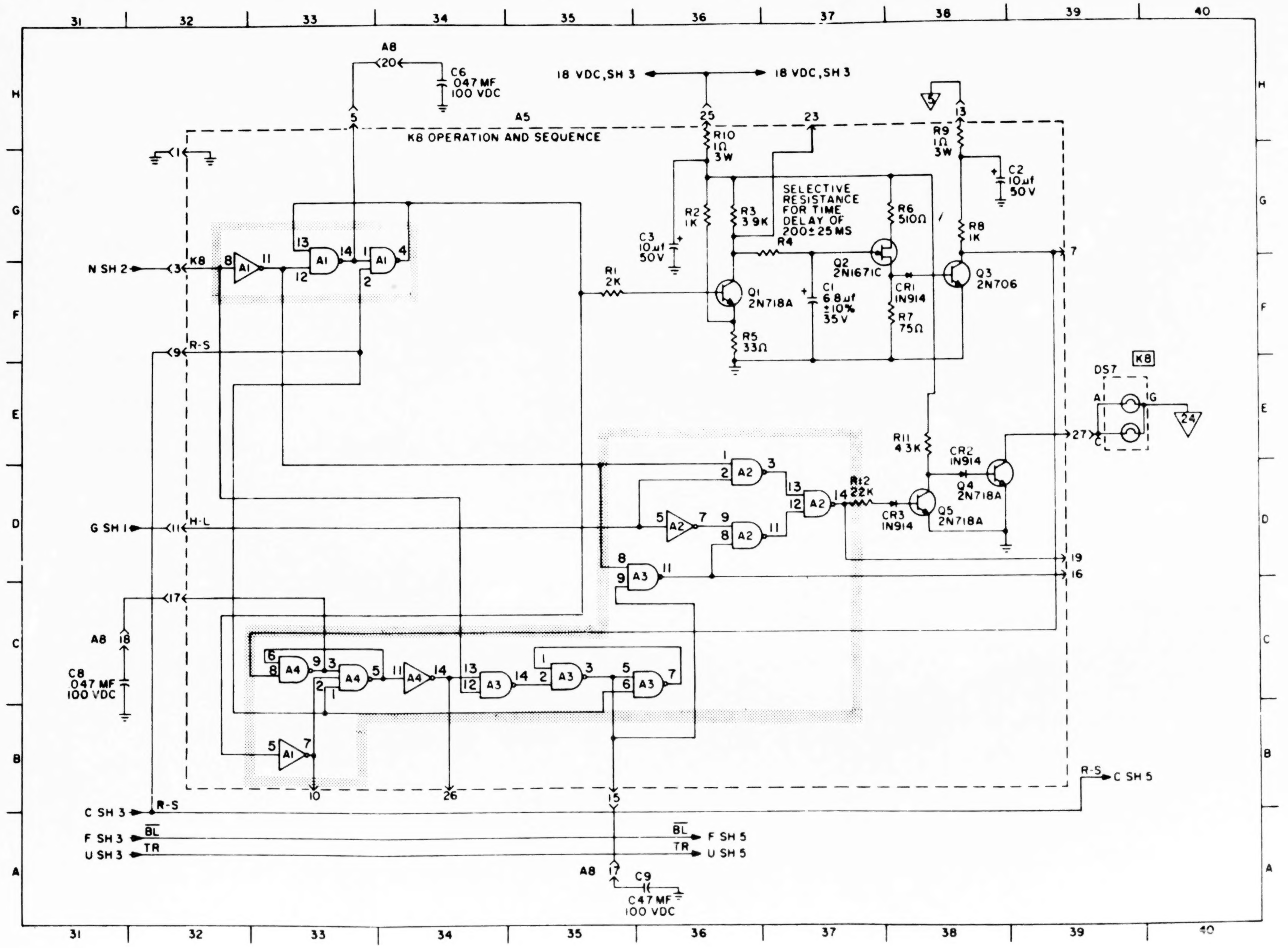
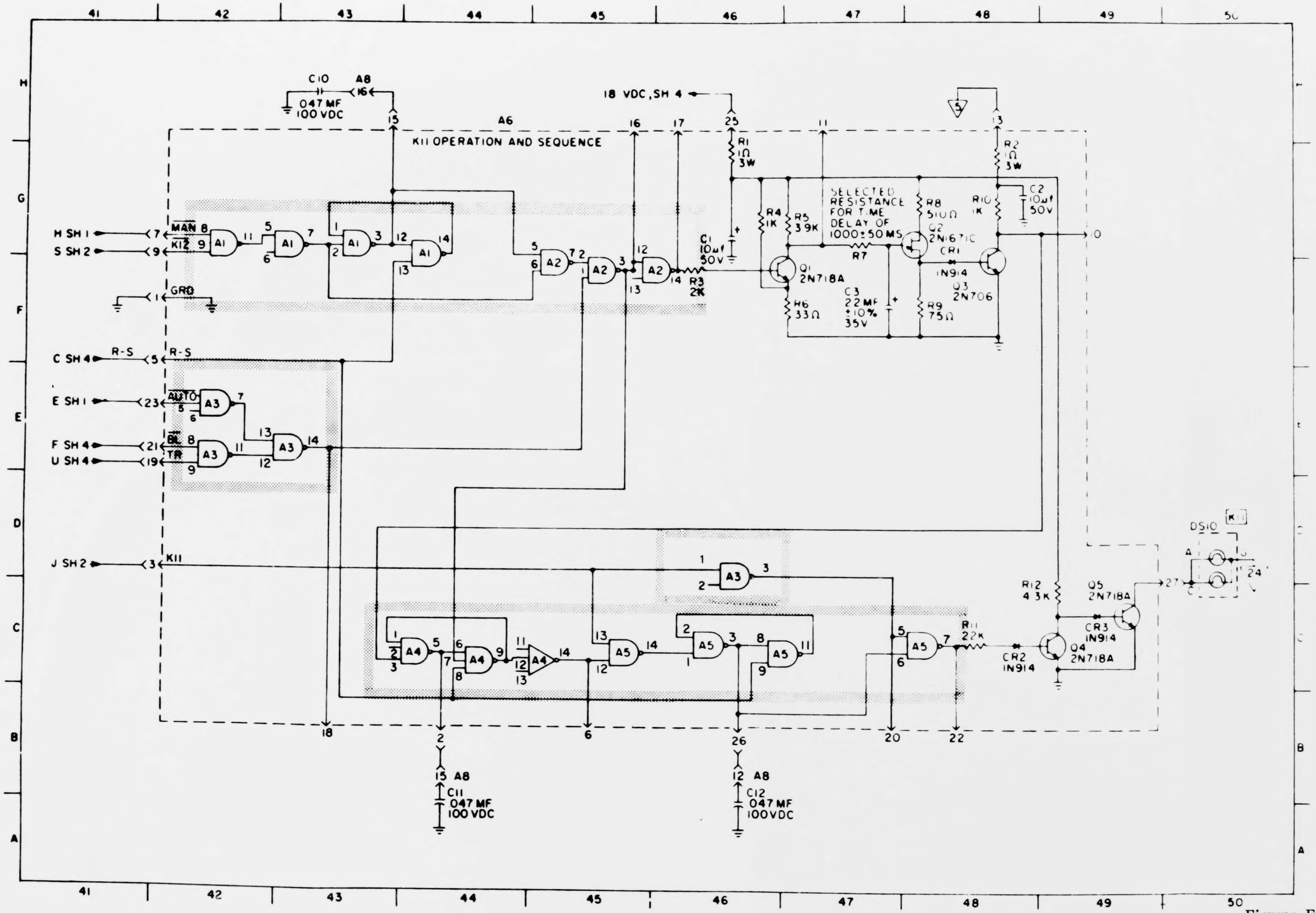

A5
K8 OPERATION AND SEQUENCE
A8
C6 .047 MF 100 VDC
18 VDC, SH 3
18 VDC, SH 3
R10 1Ω 3W
R9 1Ω 3W
C2 10µf 50V
SELECTIVE RESISTANCE FOR TIME DELAY OF 200±25 MS
R2 1K
R3 3.9K
R4
R6 510Ω
R8 1K
C3 10µf 50V
R1 2K
Q1 2N718A
Q2 2N1671C
Q3 2N706
C1 6.8µf ±10% 35V
CR1 1N914
R7 75Ω
R5 33Ω
N SH 2
K8
R-S
G SH 1
H-L
DS7
K8
R11 4.3K
CR2 1N914
Q4 2N718A
R12 22K
CR3 1N914
Q5 2N718A
A8
C8 .047 MF 100 VDC
C SH 3
F SH 3
U SH 3
R-S
BL
TR
R-S
C SH 5
F SH 5
U SH 5
C9 .C47 MF 100 VDC

Figure FO-7. Distribution box panel 2A1A2, detailed schematic (sheet 4 of 8).

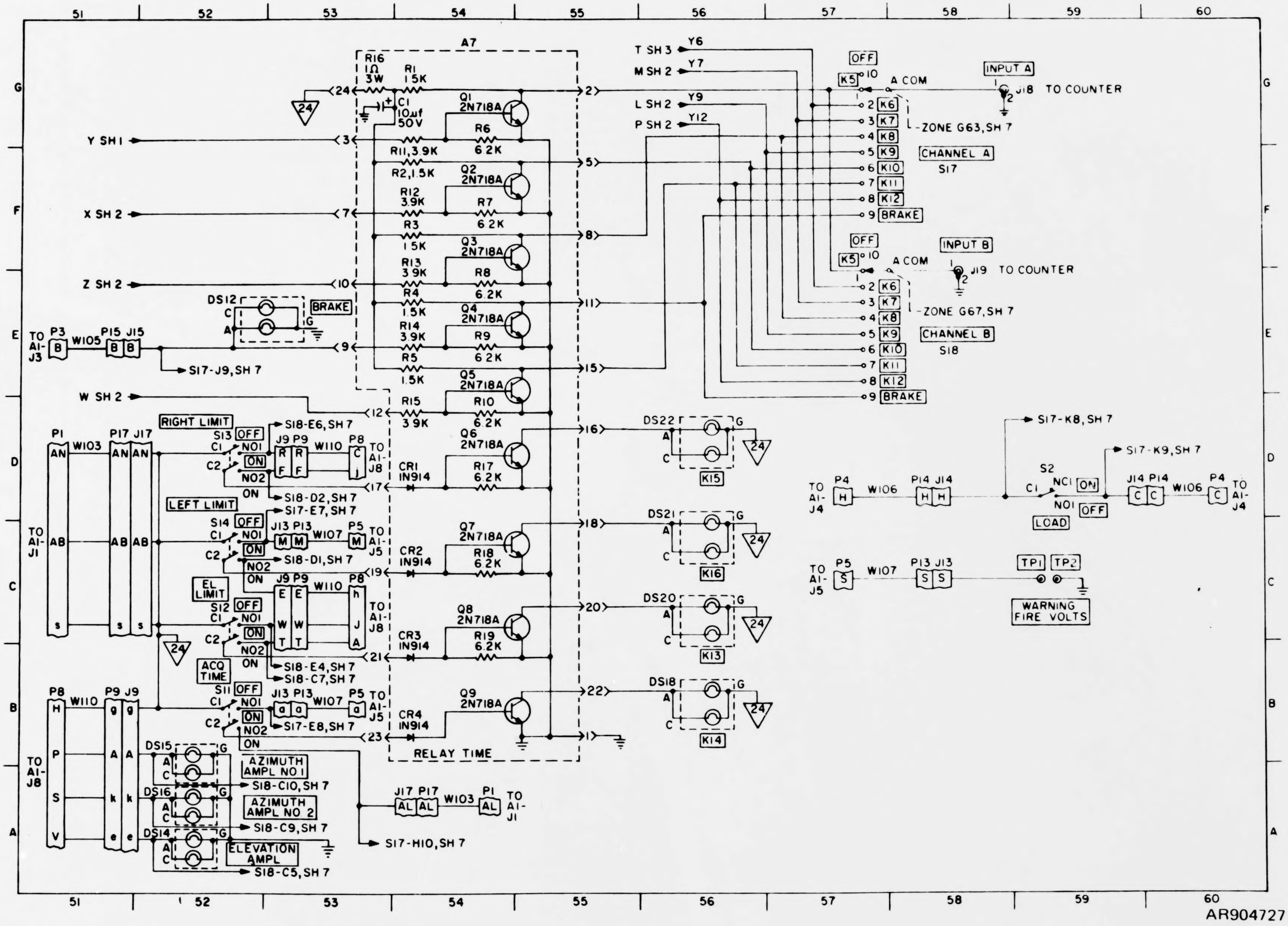
ARR82-28639

Change 1

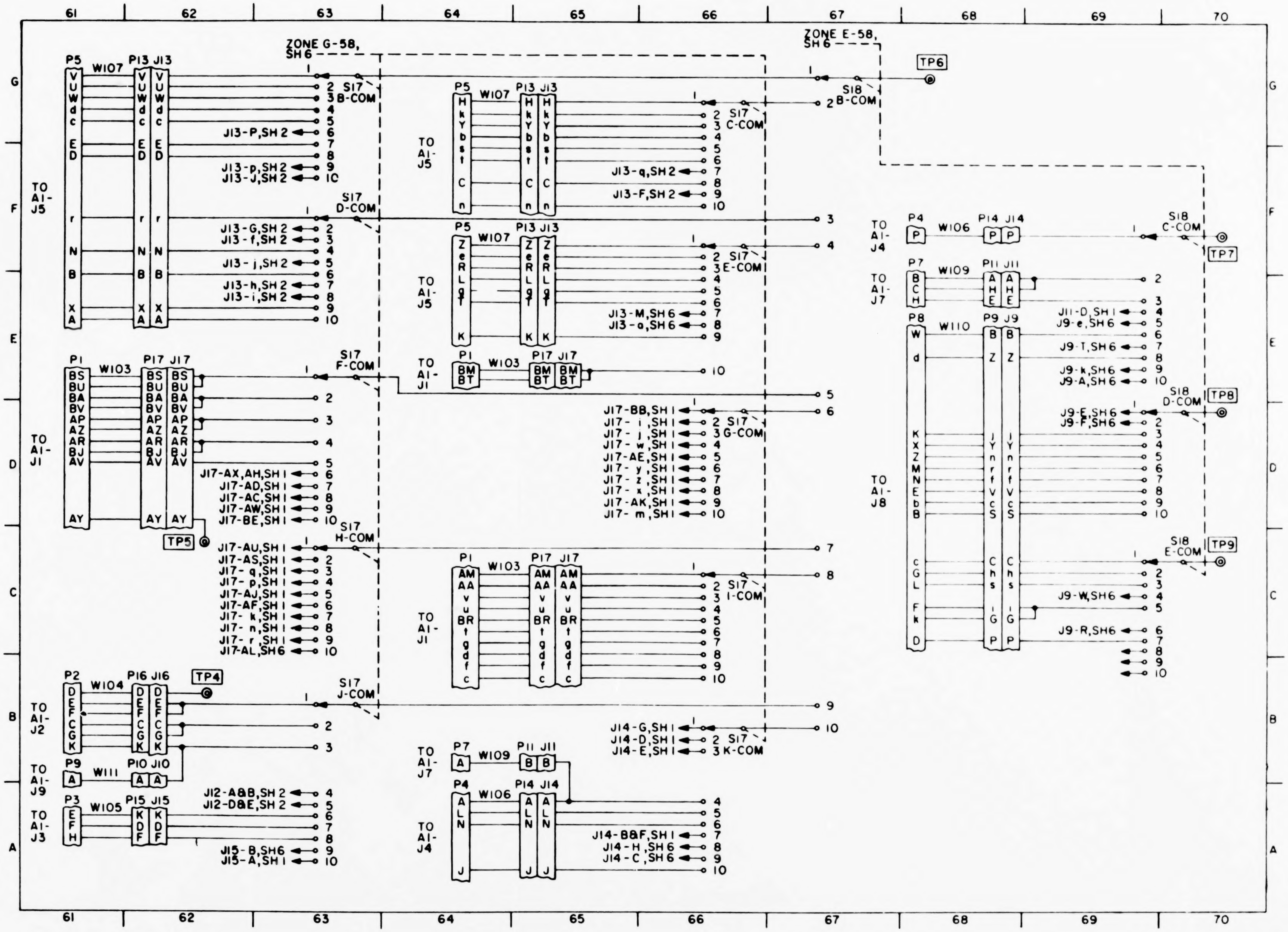

A6
K11 OPERATION AND SEQUENCE
C10
.047 MF
100 VDC
A8
16
15
18 VDC, SH 4
16
17
25
11
5
13
R1
1Ω
3W
R2
1Ω
3W
H SH 1
S SH 2
MAN
K12
GRD
C SH 4
R-S
E SH 1
AUTO
F SH 4
U SH 4
BL
TR
J SH 2
K11
A1
A2
A3
A4
A5
C1
10µf
50V
R3
2K
R4
1K
R5
3.9K
R6
33Ω
Q1
2N718A
SELECTED RESISTANCE FOR TIME DELAY OF 1000±50 MS
R7
C3
22 MF
±10%
35V
R8
510Ω
R9
75Ω
Q2
2N1671C
CR1
1N914
Q3
2N706
R10
1K
C2
10µf
50V
10
R11
22K
CR2
1N914
R12
4.3K
Q4
2N718A
Q5
2N718A
CR3
1N914
DS10
K11
27
24
18
2
6
26
20
22
15 A8
C11
.047 MF
100 VDC
12 A8
C12
.047 MF
100 VDC
41
42
43
44
45
46
47
48
49
50
H
G
F
E
D
C
B
A

ARR82-28640

Figure FO-7. Distribution box panel 2A1A2, detailed schematic (sheet 5 of 8).


51
52
53
54
55
56
57
58
59
60
G
F
E
D
C
B
A
A7
R16
1Ω
3W
R1
1.5K
C1
10μf
50V
Q1
2N718A
R6
6.2K
R11, 3.9K
R2, 1.5K
Q2
2N718A
R12
3.9K
R7
6.2K
R3
1.5K
Q3
2N718A
R13
3.9K
R8
6.2K
R4
1.5K
Q4
2N718A
R14
3.9K
R9
6.2K
R5
1.5K
Q5
2N718A
R15
3.9K
R10
6.2K
Q6
2N718A
CR1
IN914
R17
6.2K
Q7
2N718A
CR2
IN914
R18
6.2K
Q8
2N718A
CR3
IN914
R19
6.2K
Q9
2N718A
CR4
IN914
RELAY TIME
24
Y SH 1
X SH 2
Z SH 2
W SH 2
DS12
C
A
G
BRAKE
TO AI-J3
P3
W105
P15
J15
B
S17-J9, SH 7
T SH 3
M SH 2
L SH 2
P SH 2
Y6
Y7
Y9
Y12
OFF
K5
A COM
INPUT A
J18
TO COUNTER
K6
K7
K8
K9
K10
K11
K12
BRAKE
ZONE G63, SH 7
CHANNEL A
S17
INPUT B
J19
TO COUNTER
ZONE G67, SH 7
CHANNEL B
S18
DS22
K15
DS21
K16
DS20
K13
DS18
K14
S17-K8, SH 7
S17-K9, SH 7
TO AI-J4
P4
H
W106
P14
J14
S2
C1
NC1
ON
NO1
OFF
LOAD
C
TO AI-J5
P5
S
W107
P13
J13
TP1
TP2
WARNING FIRE VOLTS
P1
P17
J17
AN
W103
AB
s
TO AI-J1
RIGHT LIMIT
S13
OFF
NO1
ON
NO2
C2
S18-E6, SH 7
J9
P9
R
F
W110
P8
j
TO AI-J8
S18-D2, SH 7
LEFT LIMIT
S14
S17-E7, SH 7
M
TO AI-J5
S18-D1, SH 7
EL LIMIT
S12
E
W
T
h
J
A
S18-E4, SH 7
S18-C7, SH 7
ACQ TIME
S11
a
S17-E8, SH 7
P8
W110
P9
J9
H
P
S
V
g
k
e
TO AI-J8
DS15
AZIMUTH AMPL NO 1
S18-C10, SH 7
DS16
AZIMUTH AMPL NO 2
S18-C9, SH 7
DS14
ELEVATION AMPL
S18-C5, SH 7
J17
P17
AL
W103
P1
TO AI-J1
S17-H10, SH 7
AR904727

FO-7. Distribution box panel 2A1A2, detailed schematic (sheet 6 of 8).


61
62
63
64
65
66
67
68
69
70
G
F
E
D
C
B
A
ZONE G-58, SH 6
ZONE E-58, SH 6
TP6
TP4
TP5
TP7
TP8
TP9
P5
W107
P13
J13
TO A1-J5
J13-P,SH 2
J13-p,SH 2
J13-J,SH 2
J13-G,SH 2
J13-f,SH 2
J13-j,SH 2
J13-h,SH 2
J13-i,SH 2
S17 B-COM
S17 C-COM
S17 D-COM
S17 E-COM
S17 F-COM
S17 G-COM
S17 H-COM
S17 I-COM
S17 J-COM
S17 K-COM
S18 B-COM
S18 C-COM
S18 D-COM
S18 E-COM
J13-q,SH 2
J13-F,SH 2
J13-M,SH 6
J13-o,SH 6
P1
W103
P17
J17
TO A1-J1
J17-AX,AH,SH 1
J17-AD,SH 1
J17-AC,SH 1
J17-AW,SH 1
J17-BE,SH 1
J17-AU,SH 1
J17-AS,SH 1
J17-q,SH 1
J17-p,SH 1
J17-AJ,SH 1
J17-AF,SH 1
J17-k,SH 1
J17-n,SH 1
J17-r,SH 1
J17-AL,SH 6
J17-BB,SH 1
J17-i,SH 1
J17-j,SH 1
J17-w,SH 1
J17-AE,SH 1
J17-y,SH 1
J17-z,SH 1
J17-x,SH 1
J17-AK,SH 1
J17-m,SH 1
P2
W104
P16
J16
TO A1-J2
P9
W111
P10
J10
TO A1-J9
P3
W105
P15
J15
TO A1-J3
J12-A&B,SH 2
J12-D&E,SH 2
J15-B,SH 6
J15-A,SH 1
P7
W109
P11
J11
TO A1-J7
P4
W106
P14
J14
TO A1-J4
J14-G,SH 1
J14-D,SH 1
J14-E,SH 1
J14-B&F,SH 1
J14-H,SH 6
J14-C,SH 6
P8
W110
P9
J9
TO A1-J8
J11-D,SH 1
J9-e,SH 6
J9-T,SH 6
J9-k,SH 6
J9-A,SH 6
J9-E,SH 6
J9-F,SH 6
J9-W,SH 6
J9-R,SH 6

AR904728

FO-7. Distribution box panel 2A1A2, detailed schematic (sheet 7 of 8).
]

REF DESIG.	ZONE	REF DESIG.	ZONE	REF DESIG.	ZONE	REF DESIG.	ZONE	REF DESIG.	ZONE	REF DESIG.	ZONE	REF DESIG.	ZONE
A1R1	F-7	A3CR4	G-17	A4A4	E-22 E-27, D-23,	A5C1	F-37	A6R2	G-49	A7R16	G-53	F1	H-4
A1R2	B-7	A3CR5	G-17	A4C1	F-22	A5C2	G-38	A6R3	F-46	A7R17	D-54	S1	B-3, B-4
A1R3	G-7	A3CR6	F-16	A4C2	F-25	A5C3	G-36	A6R4	G-46	A7R18	C-54	S2	D-59
A1R4	G-7	A3CR7	F-17	A4C3	E-24	A5CR1	F-38	A6R5	F-47	A7R19	B-54	S3	G-4
A1R5	E-7	A3CR8	B-16	A4CR1	E-25	A5CR2	D-38	A6R6	F-47	A8C1	A-15	S4	G-6
A1R6	E-7	A3CR9	B-17	A4CR2	C-29	A5CR3	D-38	A6R7	G-47	A8C2	C-18	S5	A-3
A1R7	H-7	A3Q1	E-17	A4CR3	D-29	A5Q1	F-36	A6R8	G-48	A8C3	G-27	S6	A-4
A1R9	D-7	A3Q2	E-17	A4CR4	B-24	A5Q2	F-37	A6R9	F-48	A8C4	G-29	S7	A-4
A2R1	G-13	A3Q3	C-13	A4CR5	C-24	A5Q3	F-38	A6R10	G-48	A8C5	A-25	S8	E-6, D-6,
A2R2	G-13	A3Q4	C-14	A4Q1	E-23	A5Q4	D-38	A6R11	C-48	A8C6	G-34		C-6
A2R3	G-13	A3Q5	C-14	A4Q2	E-24	A5Q5	D-38	A6R12	C-49	A8C8	C-31	S9	F-6
A2R4	G-13	A3Q6	G-17	A4Q3	E-25	A5R1	F-35	A7C1	G-53	A8C9	A-36	S10	E-6
A2R5	G-13	A3Q7	G-17	A4Q4	C-29	A5R2	G-36	A7CR1	D-54	A8C10	H-43	S11	B-52
A2R6	G-13	A3Q8	F-17	A4Q5	D-30	A5R3	G-36	A7CR2	C-54	A8C11	A-44	S12	C-52
A2R7	F-13	A3Q9	F-17	A4Q6	B-24	A5R4	G-37	A7CR3	B-54	A8C12	A-46	S13	D-52
A2R8	F-13	A3Q10	B-16	A4Q7	C-25	A5R5	F-36	A7CR4	B-54	CB1	G-4	S14	C-52
A2R9	F-13	A3Q11	B-17	A4Q8	H-5	A5R6	G-38	A7Q1	G-55	DS1	F-4	S15	H-3, G-4
A2R10	F-13	A3R1	G-17	A4R1	F-22	A5R7	F-38	A7Q2	F-55	DS2	B-30	S16	G-3
A2R11	F-13	A3R2	D-14	A4R2	F-25	A5R8	G-38	A7Q3	F-55	DS3	F-3	S17	F-58, G-58,
A2R12	F-13	A3R3	E-16	A4R3	F-23	A5R9	H-38	A7Q4	E-55	DS4	E-4		G-63, F-63,
A2R13	E-13	A3R4	E-17	A4R4	F-23	A5R10	H-36	A7Q5	E-55	DS5	F-3		E-63, D-63,
A2R14	E-13	A3R5	C-13	A4R5	E-22	A5R11	E-38	A7Q6	D-55	DS6	F-18,		C-63, B63
A2R15	E-13	A3R6	D-13	A4R6	E-23	A5R12	D-37	A7Q7	C-55	DS7	E-39		A-63, D-66
A2R16	E-13	A3R7	D-13	A4R7	F-24	A6A1	G-42, G-43	A7Q8	C-55	DS8	G-18		C-66, B-66,
A2R17	E-13	A3R8	C-13	A4R8	E-24		G-44	A7Q9	B-55	DS9	C-12		A-66, G-66,
A2R18	E-13	A3R10	D-14	A4R9	F-25	A6A2	F-45, F-46	A7R1	G-54	DS10	D-50		A-66, E-66
A2R19	D-13	A3R11	C-14	A4R11	F-24	A6A3	E-42, E-43	A7R2	F-54	DS11	E-18	S18	E-58
A2R20	D-13	A3R12	C-14	A4R12	C-28		D-46	A7R3	F-54	DS12	E-53, E-52		G-67, F-70,
A3A1	G-15, G-16,	A3R13	G-16	A4R13	D-29	A6A4	C-44, C-45	A7R4	E-54	DS13	B-3		E-70, D-70,
	F-15, F-16	A3R14	G-17	A4R14	B-23	A6A5	C-45, C-46,	A7R5	E-54	DS14	A-52		C-70, B-70,
												R1	H-16
A3A2	G-15, G-16	A3R15	F-16	A4R15	C-24		C-47, G-48	A7R6	G-54	DS15	A-52	R2	E-5
A3A3	E-16, C-17	A3R16	F-17	A4R16	C-25	A6C1	G-46	A7R7	F-54	DS16	A-52	TP1	C-59
A3A4	C-16	A3R17	B-16	A4R17	H-4	A6C2	G-48	A7R8	E-54	DS17	B-12	TP2	C-59
A3A5	C-15, B-14	A3R18	B-16	A5A1	F-33, F-32	A6C3	F-47	A7R9	E-54	DS18	B-56	TP3	G-3
A3C1	G-16	A3R19	C-17		B-33	A6Q1	F-47	A7R10	D-54	DS19	C-12	TP4	B-62
A3C2	C-14	A3R20	C-13	A5A2	D-37, D-36	A6Q2	G-48	A7R11	G-54	DS20	C-56	TP5	C-62
A3C3	C-14	A4A1	E-29, C-24	A5A3	C-35, C-36	A6Q3	F-48	A7R12	F-54	DS21	C-56	TP6	G-68
A3CR1	E-17		E-30		C-34, D-36	A6Q4	C-49	A7R13	E-54	DS22	D-56	TP7	F-70
A3CR2	E-17	A4A2	E-28, E-29	A5A4	C-33, C-34	A6Q5	C-49	A7R14	E-54	DS23	H-5	TP8	D-70
A3CR3	C-14	A4A3	F-26, E-21			A6R1	G-46	A7R15	D-54	DS24	G-4	TP9	C-70
												TP10	E-5
												TP11	E-5

SHEET NO.	ZONES
1	1 THRU 10
2	11 THRU 19
3	20 THRU 30
4	31 THRU 40
5	41 THRU 50
6	51 THRU 60
7	61 THRU 70

NOTES:

1. REFERENCE DESIGNATIONS SHOWN ARE ABBREVIATED. FOR COMPLETE DESIGNATION PREFIX WITH 2A1A2.
2. UNLESS OTHERWISE SPECIFIED ALL RESISTORS ARE 1/2 WATT ±5%.
3. ASSUME POSITIVE LOGIC OPERATION FOR ALL LOGIC GATES.
4. A BAR OVER A LOGIC FUNCTION INDICATES NEGATION. EXAMPLE: IF K6 IS ZERO THEN $\overline{K6}$ IS ONE.
5. ON MODULES A3, A4, A5 & A6 LOGIC GATES RECEIVE THEIR POWER RETURN ON PINS J AND +5 VDC ON PINS D.
6. ALL LOGIC GATES ARE INVERTING.

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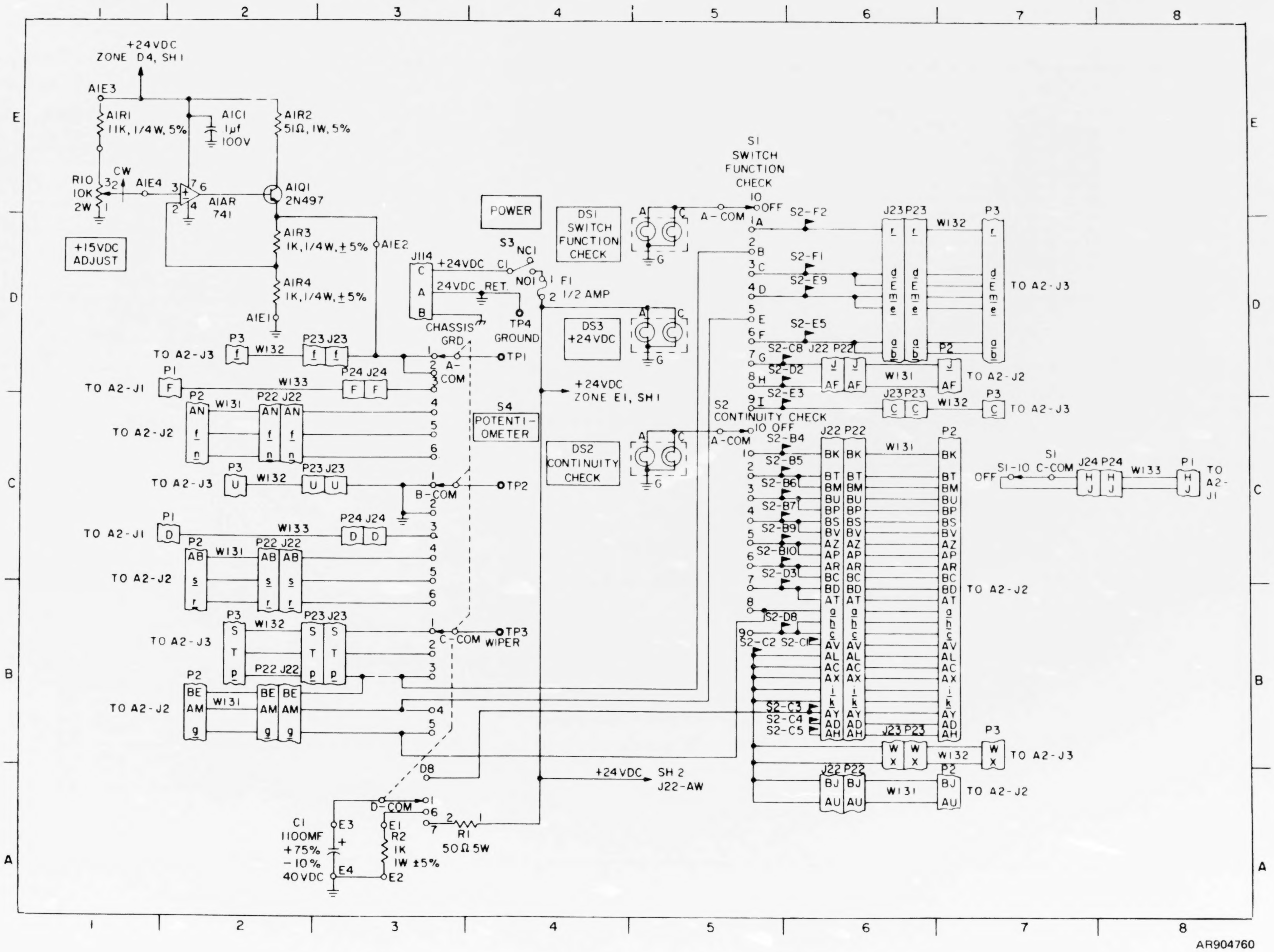
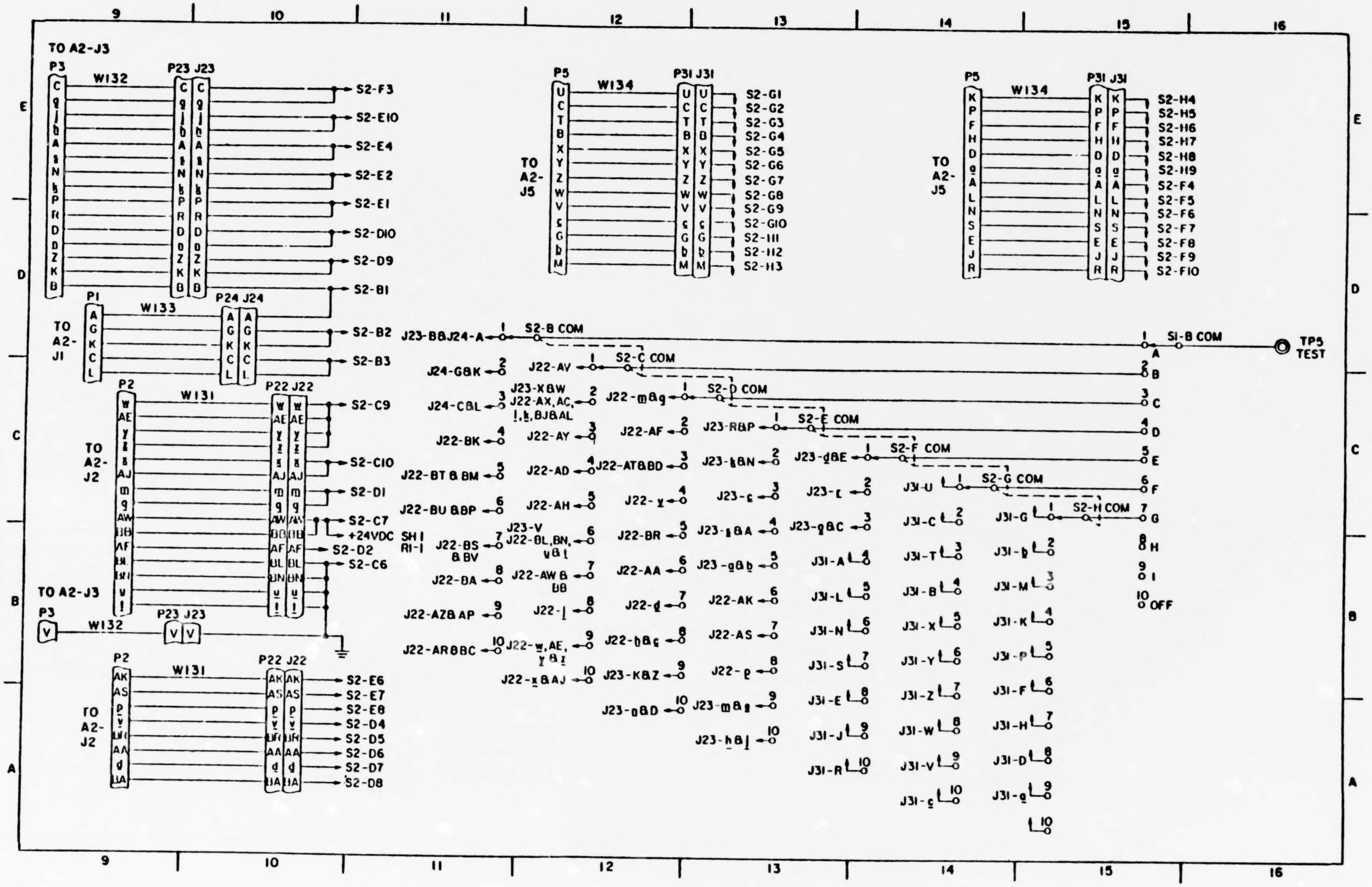
FO-7. Distribution box panel 2A1A2, detailed schematic (sheet 8 of 8).


+24VDC ZONE D4, SH1
A1E3
A1R1 11K, 1/4W, 5%
A1C1 1µf 100V
A1R2 51Ω, 1W, 5%
R10 10K 2W
CW
A1E4
A1AR 741
A1Q1 2N497
+15VDC ADJUST
A1R3 1K, 1/4W, ±5%
A1E2
A1R4 1K, 1/4W, ±5%
A1E1
POWER
S3
NC1
NO1
C1
F1 1/2 AMP
J114
+24VDC
24VDC RET.
TP4 GROUND
CHASSIS GRD.
DS1 SWITCH FUNCTION CHECK
DS3 +24VDC
DS2 CONTINUITY CHECK
+24VDC ZONE E1, SH1
S4 POTENTI-OMETER
S1 SWITCH FUNCTION CHECK
A-COM
10 OFF
S2-F2
S2-F1
S2-E9
S2-E5
S2-C8
S2-D2
S2-E3
J23 P23
W132
P3
TO A2-J3
J22 P22
W131
P2
TO A2-J2
S2 CONTINUITY CHECK
S2-B4
S2-B5
S2-B6
S2-B7
S2-B9
S2-B10
S2-D3
S2-D8
S2-C2
S2-C1
S2-C3
S2-C4
S2-C5
S1-10
C-COM
OFF
J24 P24
W133
P1
TO A2-J1
TO A2-J3
TO A2-J1
TO A2-J2
TP1
TP2
TP3 WIPER
B-COM
C-COM
D-COM
D8
+24VDC SH 2 J22-AW
C1 1100MF +75% -10% 40VDC
E3
E4
E1
E2
R2 1K 1W ±5%
R1 50Ω 5W
AR904760

FO-8. Control panel 2A2A1, detailed schematic (sheet 1 of 2).


TO A2-J3
P3
W132
P23 J23
S2-F3
S2-E10
S2-E4
S2-E2
S2-E1
S2-D10
S2-D9
S2-B1
P1
W133
P24 J24
TO A2-J1
S2-B2
S2-B3
P2
W131
P22 J22
TO A2-J2
S2-C9
S2-C10
S2-D1
S2-C7
+24VDC SH1 R1-1
S2-D2
S2-C6
TO A2-J3
S2-E6
S2-E7
S2-E8
S2-D4
S2-D5
S2-D6
S2-D7
S2-D8
P5
W134
P31 J31
TO A2-J5
S2-G1
S2-G2
S2-G3
S2-G4
S2-G5
S2-G6
S2-G7
S2-G8
S2-G9
S2-G10
S2-I1
S2-I2
S2-I3
S2-H4
S2-H5
S2-H6
S2-H7
S2-H8
S2-H9
S2-F4
S2-F5
S2-F6
S2-F7
S2-F8
S2-F9
S2-F10
S2-B COM
S2-C COM
S2-D COM
S2-E COM
S2-F COM
S2-G COM
S2-H COM
S1-B COM
TP5 TEST
10 OFF
E
D
C
B
A
9
10
11
12
13
14
15
16

AR904760

FO-8. Control panel 2A2A1, detailed schematic (sheet 2 of 2).

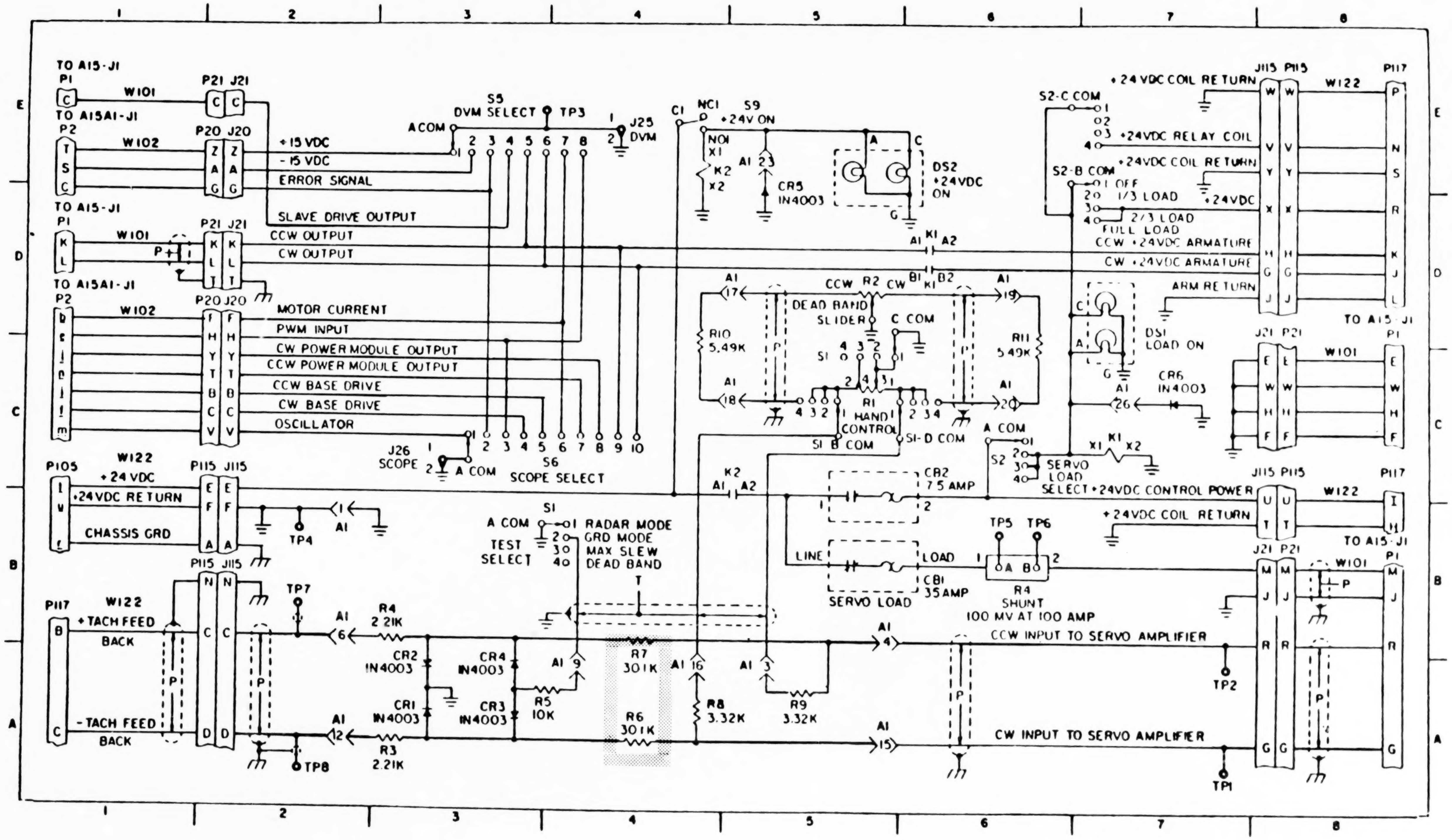

TO A15-J1
P1
W101
P21 J21
TO A15A1-J1
P2
W102
P20 J20
+15 VDC
-15 VDC
ERROR SIGNAL
SLAVE DRIVE OUTPUT
CCW OUTPUT
CW OUTPUT
MOTOR CURRENT
PWM INPUT
CW POWER MODULE OUTPUT
CCW POWER MODULE OUTPUT
CCW BASE DRIVE
CW BASE DRIVE
OSCILLATOR
S5
DVM SELECT
TP3
J25
DVM
A COM
J26
SCOPE
S6
SCOPE SELECT
P105
W122
+24 VDC
+24VDC RETURN
CHASSIS GRD
P115 J115
TP4
TP7
TP8
P117
+TACH FEED BACK
-TACH FEED BACK
R4 2.21K
R3 2.21K
CR2 1N4003
CR1 1N4003
CR4 1N4003
CR3 1N4003
R5 10K
R7 301K
R6 301K
R8 3.32K
R9 3.32K
S1
TEST SELECT
RADAR MODE
GRD MODE
MAX SLEW
DEAD BAND
C1
NC1
NO1
S9
+24V ON
K2
CR5 1N4003
DS2 +24VDC ON
K1
CCW R2 CW
DEAD BAND SLIDER
C COM
R10 5.49K
R11 5.49K
R1 HAND CONTROL
S1-B COM
S1-D COM
CB2 7.5 AMP
CB1 35 AMP
LINE
LOAD
SERVO LOAD
TP5 TP6
R4 SHUNT 100 MV AT 100 AMP
CCW INPUT TO SERVO AMPLIFIER
CW INPUT TO SERVO AMPLIFIER
TP2
TP1
S2-C COM
S2-B COM
OFF
1/3 LOAD
2/3 LOAD
FULL LOAD
+24VDC COIL RETURN
+24VDC RELAY COIL
+24VDC
CCW +24VDC ARMATURE
CW +24VDC ARMATURE
ARM RETURN
DS1 LOAD ON
CR6 1N4003
S2
SERVO LOAD SELECT
+24VDC CONTROL POWER
J115 P115
P117
TO A15-J1
J21 P21
ARR82-28641

Figure FO-9. Servo amplifier 2A2A2, detailed schematic (sheet 1 of 2).

REF DESIG.	ZONE	REF DESIG.	ZONE	REF DESIG.	ZONE	REF DESIG.	ZONE
A1CR1	A-3	A1R7	B-4	K1	C7, D-6	S6	C-3, C-4
A1CR2	A-3	A1R8	A-4	K2	E-4, C-5	S9	E-4
A1CR3	A-3	A1R9	A-5	R1	C-5	TP1	A-7
A1CR4	A-3	A1R10	C-4	R2	D-5	TP2	A-7
A1CR5	D-5	A1R11	C-6	R4	B-4	TP3	E-4
A1CR6	G-7	CB1	B-6	S1	B-4	TP4	B-2
A1R3	A-3	CB2	C-6		C-5, C-6	TP5	B-6
A1R4	B-3	DS1	D-7	S2	E-7, D-7	TP6	B-6
A1R5	A-4	DS2	D-6	S5	E-3, E-4	TP7	B-2
A1R6	A-4					TP8	A-2

NOTES:

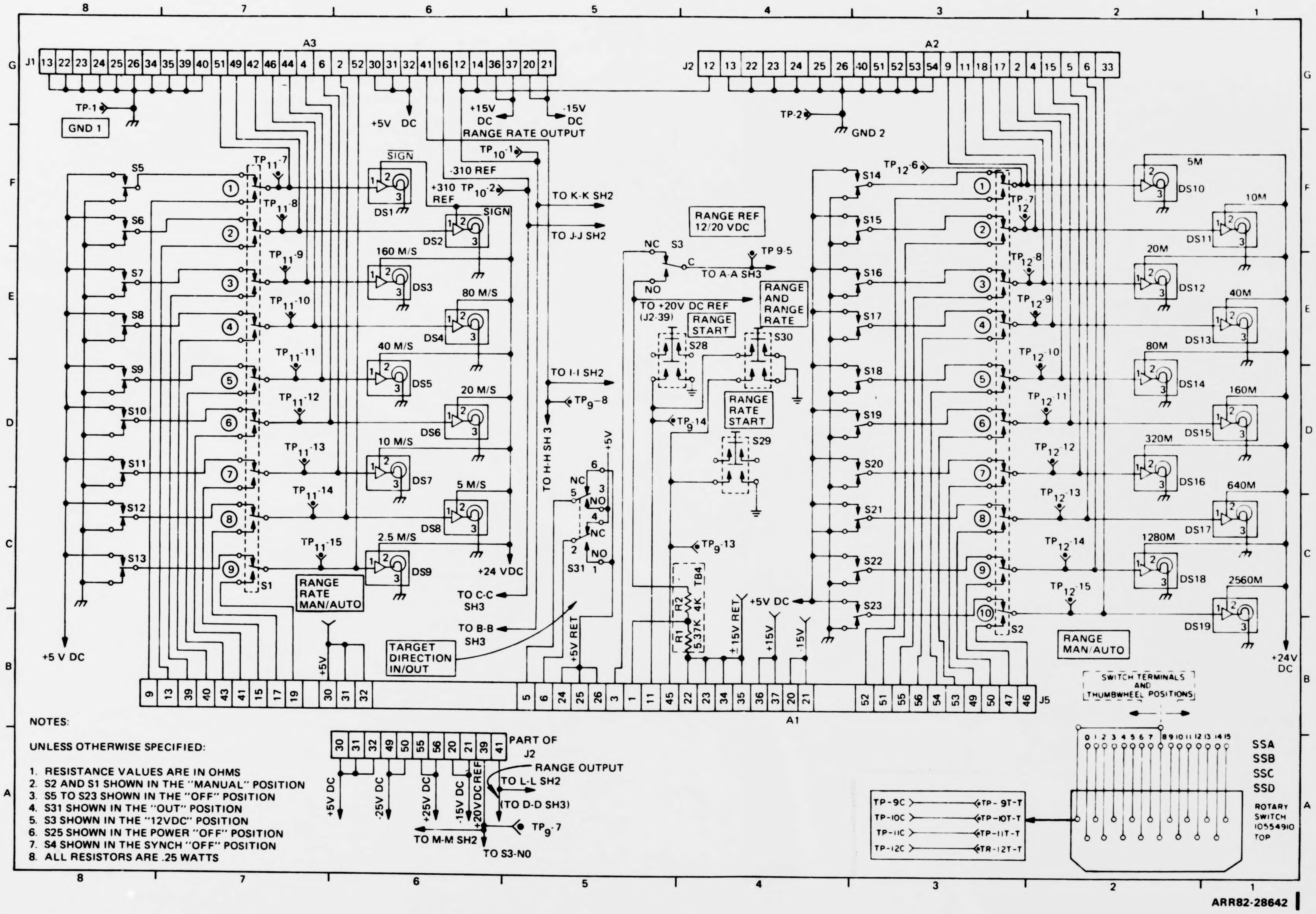
1. REFERENCE DESIGNATIONS SHOWN ARE ABBREVIATED. FOR COMPLETE DESIGNATION, PREFIX WITH 2A2A2.

2. CONTACTS C1 AND C2 ON RELAY K2 ARE USED FOR GROUND TIE POINTS ONLY AND ARE NOT ELECTRICALLY FUNCTIONAL.

3. ALL RESISTORS ARE 1/2 WATT ±1% UNLESS OTHERWISE SPECIFIED.

AR904835

FO-9. Servo amplifier 2A2A2, detailed schematic (sheet 2 of 2).


A3
J1
A2
J2
GND 1
GND 2
TP-1
TP-2
+5V DC
+15V DC
-15V DC
RANGE RATE OUTPUT
-310 REF
+310 REF
SIGN
TO K-K SH2
TO J-J SH2
TO I-I SH2
TO H-H SH 3
TO C-C SH3
TO B-B SH3
160 M/S
80 M/S
40 M/S
20 M/S
10 M/S
5 M/S
2.5 M/S
+24 VDC
RANGE RATE MAN/AUTO
TARGET DIRECTION IN/OUT
RANGE REF 12/20 VDC
TO A-A SH3
TO +20V DC REF (J2-39)
RANGE START
RANGE AND RANGE RATE
RANGE RATE START
S28
S29
S30
S31
TB4
R1 5.37K
R2 4K
5M
10M
20M
40M
80M
160M
320M
640M
1280M
2560M
RANGE MAN/AUTO
+24V DC
J5
A1
SWITCH TERMINALS AND THUMBWHEEL POSITIONS
SSA
SSB
SSC
SSD
ROTARY SWITCH 10554910 TOP
PART OF J2
RANGE OUTPUT
TO L-L SH2
(TO D-D SH3)
TO M-M SH2
TO S3-NO
ARR82-28642

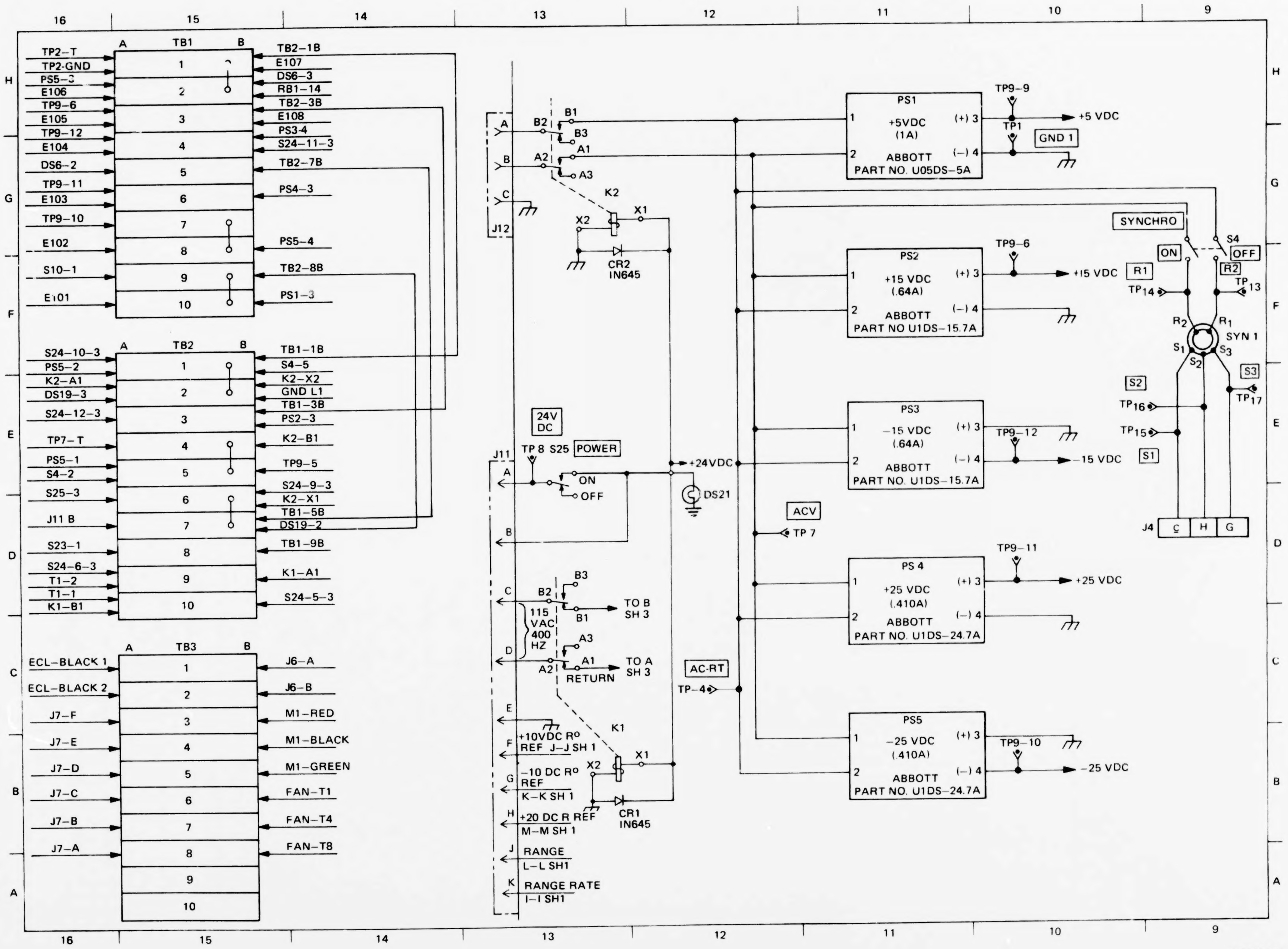
NOTES:

UNLESS OTHERWISE SPECIFIED:

1. RESISTANCE VALUES ARE IN OHMS
2. S2 AND S1 SHOWN IN THE "MANUAL" POSITION
3. S5 TO S23 SHOWN IN THE "OFF" POSITION
4. S31 SHOWN IN THE "OUT" POSITION
5. S3 SHOWN IN THE "12VDC" POSITION
6. S25 SHOWN IN THE POWER "OFF" POSITION
7. S4 SHOWN IN THE SYNCH "OFF" POSITION
8. ALL RESISTORS ARE .25 WATTS

Figure FO-10. SCG servo test panel 2A2A6, detailed schematic (sheet 1 of 4).

Change 1


16
15
14
13
12
11
10
9
H
G
F
E
D
C
B
A
TB1
TP2–T
TP2-GND
PS5–3
E106
TP9–6
E105
TP9–12
E104
DS6–2
TP9–11
E103
TP9–10
E102
S10–1
E101
TB2–1B
E107
DS6–3
RB1–14
TB2–3B
E108
PS3-4
S24–11–3
TB2–7B
PS4–3
PS5–4
TB2–8B
PS1–3
TB2
S24–10–3
PS5–2
K2–A1
DS19–3
S24–12–3
TP7–T
PS5–1
S4–2
S25–3
J11 B
S23–1
S24–6–3
T1–2
T1–1
K1–B1
TB1–1B
S4–5
K2–X2
GND L1
TB1–3B
PS2–3
K2–B1
TP9–5
S24–9–3
K2–X1
TB1–5B
DS19–2
TB1–9B
K1–A1
S24–5–3
TB3
ECL–BLACK 1
ECL–BLACK 2
J7–F
J7–E
J7–D
J7–C
J7–B
J7–A
J6–A
J6–B
M1–RED
M1–BLACK
M1–GREEN
FAN–T1
FAN–T4
FAN–T8
J12
B2
B1
B3
A2
A1
A3
K2
X1
X2
CR2
IN645
24V DC
TP 8
S25
POWER
J11
ON
OFF
+24VDC
DS21
115 VAC 400 HZ
TO B SH 3
TO A SH 3
RETURN
K1
CR1
IN645
+10VDC R° REF J–J SH 1
–10 DC R° REF K–K SH 1
+20 DC R REF M–M SH 1
RANGE L–L SH1
RANGE RATE I–I SH1
ACV
TP 7
AC-RT
TP–4
PS1
+5VDC (1A)
ABBOTT PART NO. U05DS–5A
TP9–9
TP1
+5 VDC
GND 1
PS2
+15 VDC (.64A)
ABBOTT PART NO U1DS–15.7A
TP9–6
+15 VDC
PS3
–15 VDC (.64A)
ABBOTT PART NO. U1DS–15.7A
TP9–12
–15 VDC
PS 4
+25 VDC (.410A)
ABBOTT PART NO. U1DS–24.7A
TP9–11
+25 VDC
PS5
–25 VDC (.410A)
ABBOTT PART NO. U1DS–24.7A
TP9–10
–25 VDC
(+) 3
(–) 4
SYNCHRO
S4
ON
OFF
R1
R2
TP14
TP13
SYN 1
S1
S2
S3
TP16
TP15
TP17
J4
C
H
G
AR918161

FO-10. SCG servo test panel 2A2A6, detailed schematic (sheet 2 of 4).

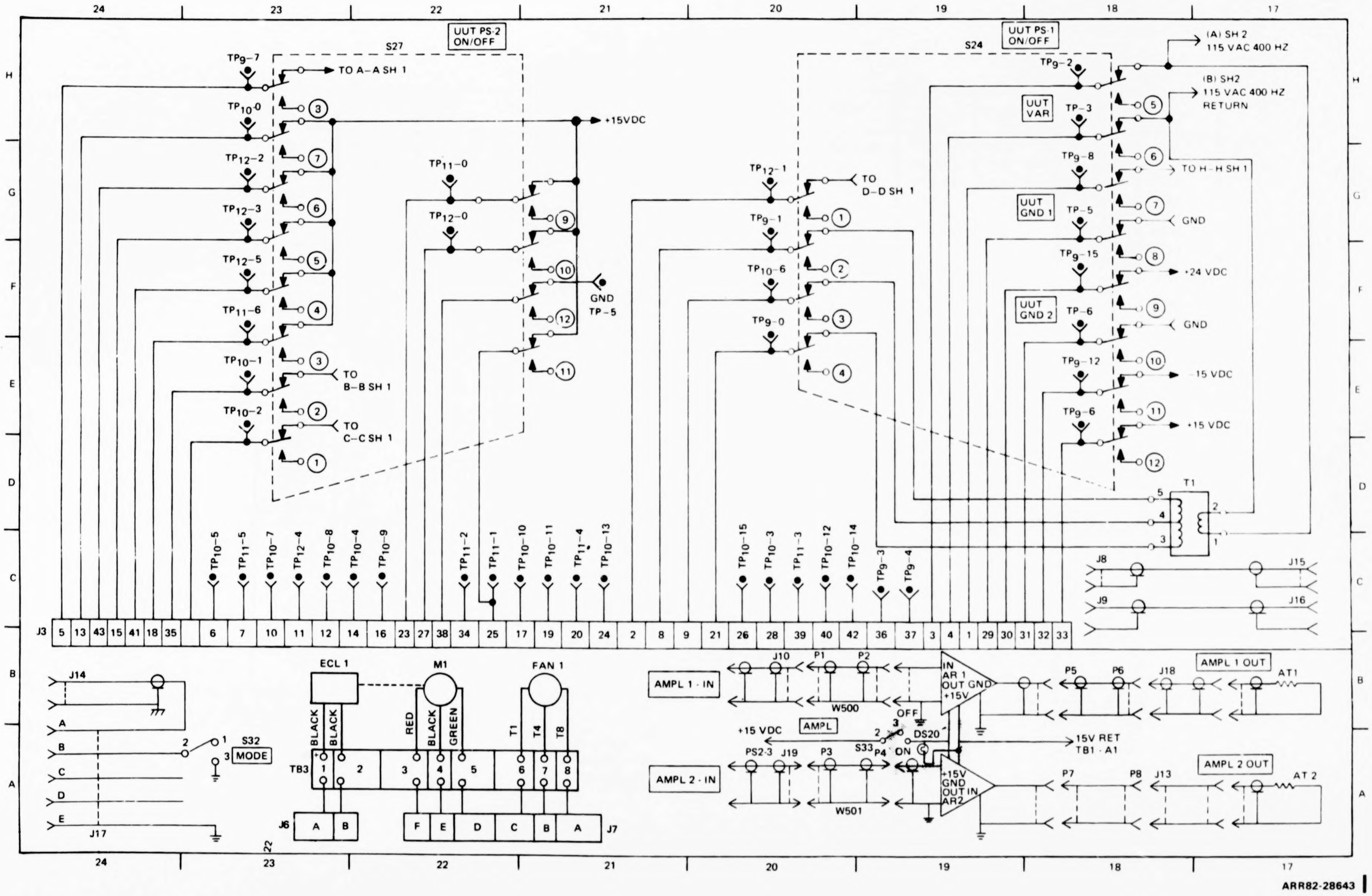

UUT PS-2 ON/OFF
S27
TO A–A SH 1
+15VDC
TP9–7
TP10–0
TP12–2
TP12–3
TP12–5
TP11–6
TP10–1
TP10–2
TO B–B SH 1
TO C–C SH 1
TP11–0
TP12–0
GND TP–5
UUT PS-1 ON/OFF
S24
TP12–1
TO D–D SH 1
TP9–1
TP10–6
TP9–0
(A) SH 2 115 VAC 400 HZ
(B) SH2 115 VAC 400 HZ RETURN
TP9–2
UUT VAR
TP–3
TP9–8
TO H–H SH 1
UUT GND 1
TP–5
GND
TP9–15
+24 VDC
UUT GND 2
TP–6
GND
TP9–12
–15 VDC
TP9–6
+15 VDC
T1
TP10–5
TP11–5
TP10–7
TP12–4
TP10–8
TP10–4
TP10–9
TP11–2
TP11–1
TP10–10
TP10–11
TP11–4
TP10–13
TP10–15
TP10–3
TP11–3
TP10–12
TP10–14
TP9–3
TP9–4
J8
J15
J9
J16
J3
5 13 43 15 41 18 35 6 7 10 11 12 14 16 23 27 38 34 25 17 19 20 24 2 8 9 21 26 28 39 40 42 36 37 3 4 1 29 30 31 32 33
J14
A
B
C
D
E
J17
S32
MODE
ECL 1
M1
FAN 1
BLACK
BLACK
RED
BLACK
GREEN
T1
T4
T8
TB3
J6
A B
F E D C B A
J7
AMPL 1 - IN
J10
P1
P2
W500
AR 1
IN
OUT GND
+15V
P5
P6
J18
AMPL 1 OUT
AT1
+15 VDC
AMPL
OFF
S33
P4
ON
DS20
15V RET TB1 - A1
AMPL 2 - IN
PS2-3
J19
P3
W501
+15V
GND
OUT IN
AR2
P7
P8
J13
AMPL 2 OUT
AT 2
24 23 22 21 20 19 18 17
H G F E D C B A
ARR82-28643

Figure FO-10. SCG servo test panel 2A2A6, detailed schematic (sheet 3 of 4).

Change 1

REF DESIG.	ZONE	REF DESIG.	ZONE	REF DESIG.	ZONE	REF DESIG.	ZONE	REF DESIG.	ZONE	REF DESIG.	ZONE
CR1	B-13	J5	B-3,B-4	S12	C-8	TP1	G-8,G-10	TP9-12	E-10	TP11-13	D-7
CR2	F-13		B-5,B-6,	S13	C-8	TP2	G-4	TP9-13	C-4	TP11-14	C-7
DS1	F-6		B-7,B-8,	S14	F-3	TP3	H-8	TP9-14	D-4	TP11-15	C-7
DS2	F-6	J6	A-23	S15	F-3	TP4	C-12	TP9-15	F-18	TP12-0	G-22
DS3	E-6	J7	A-21,A-22	S16	E-3	TP5	G-18	TP10-0	H-23	TP12-1	C-23
DS4	E-6	J11	A-13, B-13	S17	E-3	TP6	F-18	TP10-1	F-5	TP12-2	G-23
DS5	D-6		C-13, D-13	S18	D-3	TP7	D-12	TP10-2	E-23	TP12-3	G-23
DS6	D-6		E-5	S19	D-3	TP8	E-5	TP10-3	C-20	TP12-4	C-21
DS7	D-6	J12	G-13	S20	D-3	TP13	F-9	TP10-4	C-22	TP12-5	F-23
DS8	C-6	K1	B-13,C-13,	S21	C-3	TP14	F-9	TP10-5	C-23	TP12-6	G-3
DS9	C-6			S22	C-3	TP15	E-9	TP10-6	F-23	TP12-7	F-3
DS10	F-2	K2	G-13,H-13	S23	C-3	TP16	E-9	TP10-7	C-23	TP12-8	E-3
DS11	F-1	M1	B-22	S24	D-18,E-18,	TP17	E-9	TP10-8	C-23	TP12-9	E-3
DS12	E-2	PS1	G-11,H-11		F-18,G-18,	TP9C	A-3	TP10-9	C-22	TP12-10	E-2
DS13	E-1	PS2	F-11		H-18,E-20	TP10C	A-3	TP10-10	C-21	TP12-11	D-2
DS14	E-2	PS3	E-11		F-20,G-20	TP11C	A-3	TP10-11	C-21	TP12-12	D-2
DS15	E-1	PS4	C-11,D-11	S25	E-7	TP12C	A-3	TP10-12	C-20	TP12-13	C-2
DS16	E-2	PS5	B-11	S27	E-21,F21,	TP9T	A-3	TP10-13	C-21	TP12-14	C-2
DS17	C-1	S1	C-7,D-7,		G-21,D-23	TP10T	A-3	TP10-14	C-20	TP12-15	C-2
DS18	C-2		E-7,F-7,		E-23,F-23,	TP11T	A-3	TP10-15	C-20	SSA	A-1,2
DS19	C1		G-7		G-23,H-23	TP12T	A-3	TP11-0	G-22	SSB	A-1,2
ECL1	B-23	S2	B-3,C-3,	S28	E-5	TP9-0	F-20	TP11-1	G-22	SSC	A-1,2
FAN 1	B-21		D-3,E-3,	S29	D-4	TP9-1	G-20	TP11-2	C-22	SSD	A-1,2
J1	G-5,G-6		F-3	S30	E-4	TP9-2	H-18	TP11-3	C-23		
	G-7,G-8	S3	E-5	S31	C-5	TP9-3	C-19	TP11-4	C-21		
J2	G-2,G-3	S4	G-9	T1	D-18	TP9-4	C-19	TP11-5	G-20		
	G-4,A-6	S5	F-8	TB1	F-15,G-15	TP9-5	F-5	TP11-6	F-23		
J3	B-18,B-19	S6	F-8		H-15	TP9-6	F-10	TP11-7	F-7		
	B-20,B-21	S7	E-8	TB2	D-15,E-15,	TP9-7	H-23	TP11-8	F-7		
	B-22,B-23	S8	E-8		F-15	TP9-8	D-5,G-18	TP11-9	E-7		
	B-24	S9	D-8	TB3	A-15,B-15	TP9-9	H-10	TP11-10	E-7		
J4	D-9	S10	D-8		C-15,A-21	TP9-10	B-10	TP11-11	D-7		
		S11	D-8		A-22	TP9-11	D-10	TP11-12	D-7		
				TB4	B-4						

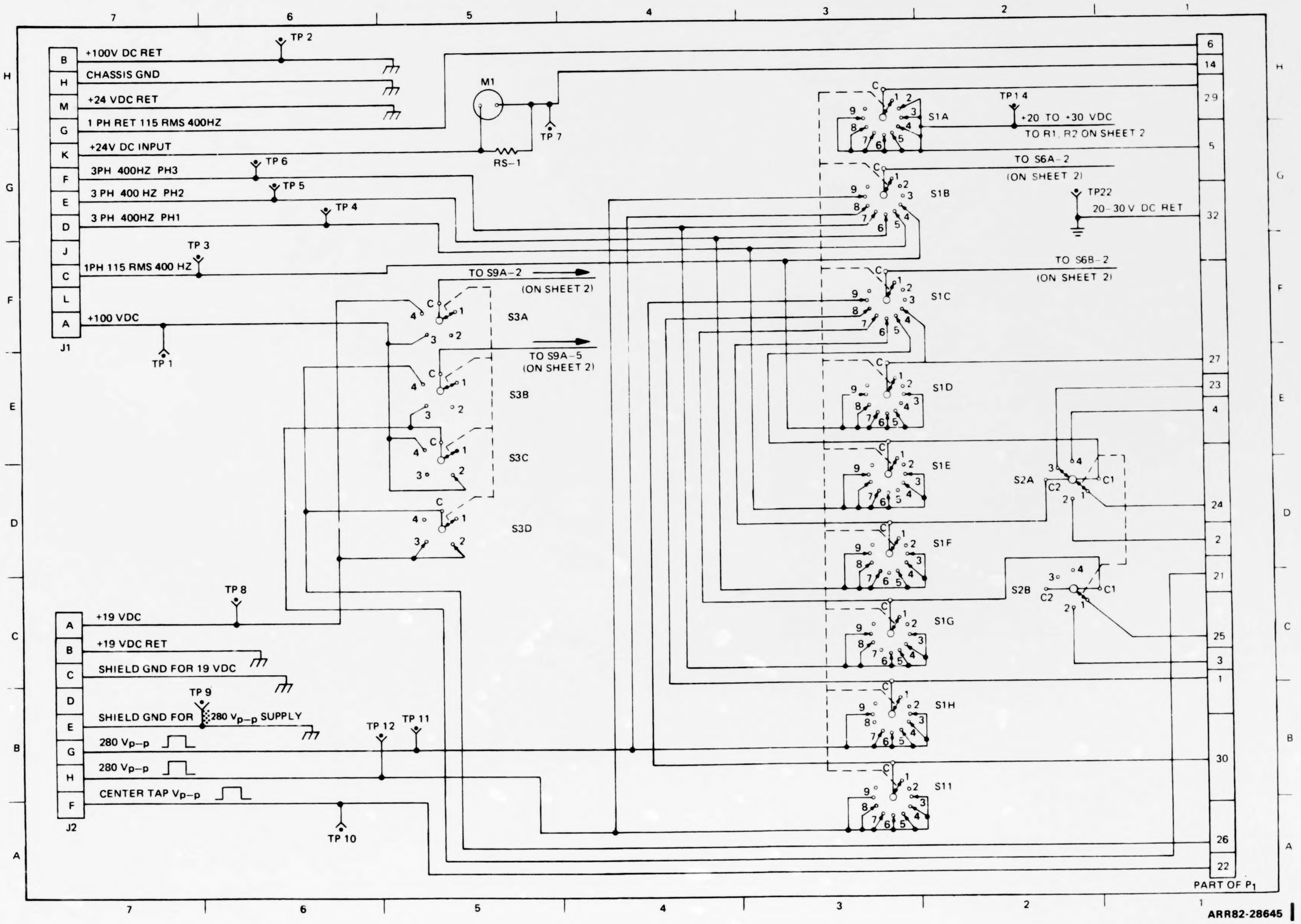
SHEET NO.	ZONE
1	1 THROUGH 8
2	9 THROUGH 16
3	17 THROUGH 24

NOTES:

1. REFERENCE DESIGNATIONS SHOWN ARE ABBREVIATED, FOR COMPLETE DESIGNATION PREFIX WITH 2A2A6

ARR82-28644

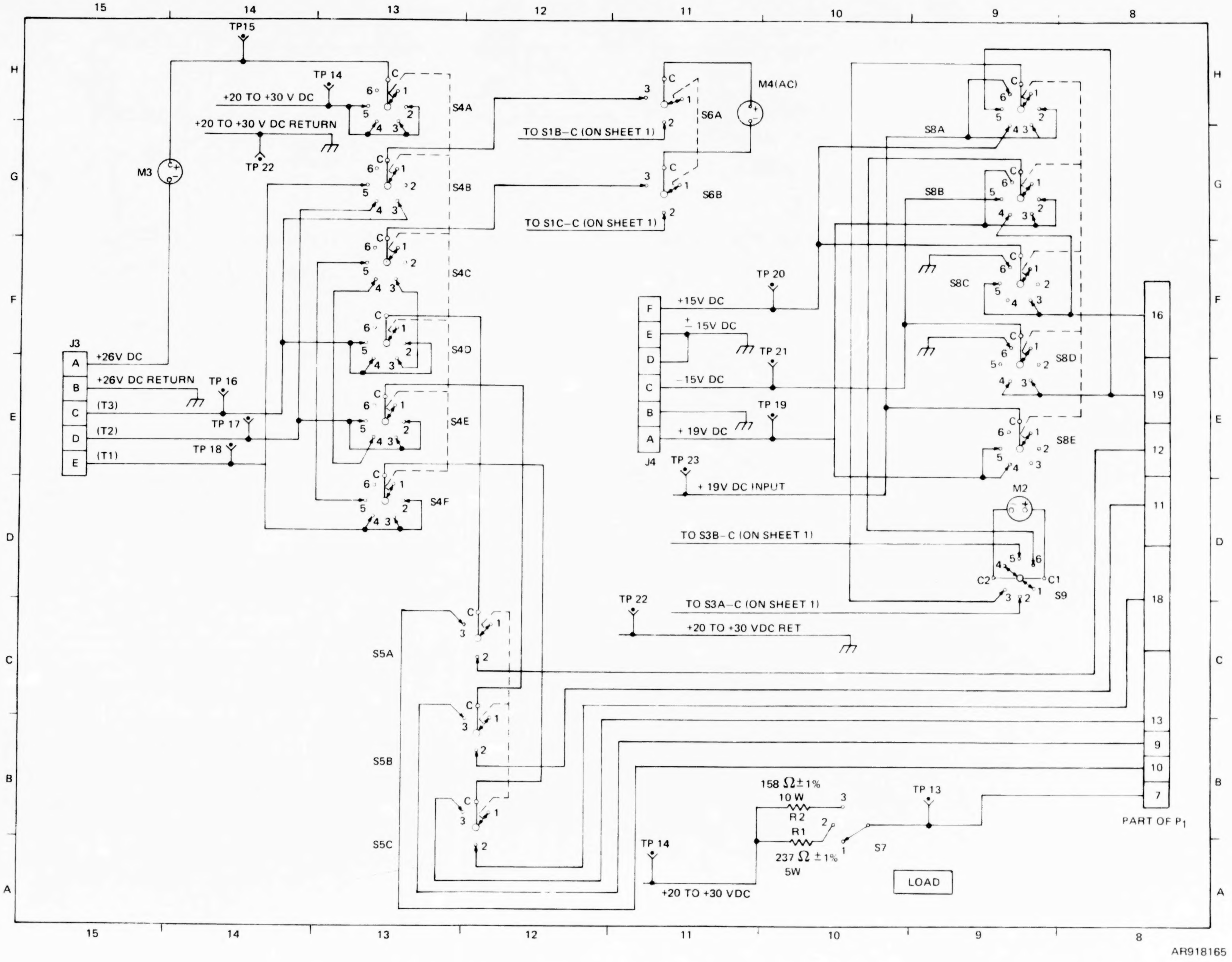
Figure FO-10. SCG servo test panel 2A2A6, detailed schematic (sheet 4 of 4).


7
6
5
4
3
2
1
H
G
F
E
D
C
B
A
J1
B +100V DC RET
H CHASSIS GND
M +24 VDC RET
G 1 PH RET 115 RMS 400HZ
K +24V DC INPUT
F 3PH 400HZ PH3
E 3 PH 400 HZ PH2
D 3 PH 400HZ PH1
J
C 1PH 115 RMS 400 HZ
L
A +100 VDC
TP 1
TP 2
TP 3
TP 4
TP 5
TP 6
TP 7
M1
RS-1
TO S9A-2 (ON SHEET 2)
TO S9A-5 (ON SHEET 2)
S3A
S3B
S3C
S3D
S1A
S1B
S1C
S1D
S1E
S1F
S1G
S1H
S1I
TP14
+20 TO +30 VDC
TO R1, R2 ON SHEET 2
TO S6A-2 (ON SHEET 2)
TP22
20-30 V DC RET
TO S6B-2 (ON SHEET 2)
S2A
S2B
C1
C2
J2
A +19 VDC
B +19 VDC RET
C SHIELD GND FOR 19 VDC
D
E SHIELD GND FOR 280 Vp-p SUPPLY
G 280 Vp-p
H 280 Vp-p
F CENTER TAP Vp-p
TP 8
TP 9
TP 10
TP 11
TP 12
6
14
29
5
32
27
23
4
24
2
21
25
3
1
30
26
22
PART OF P1

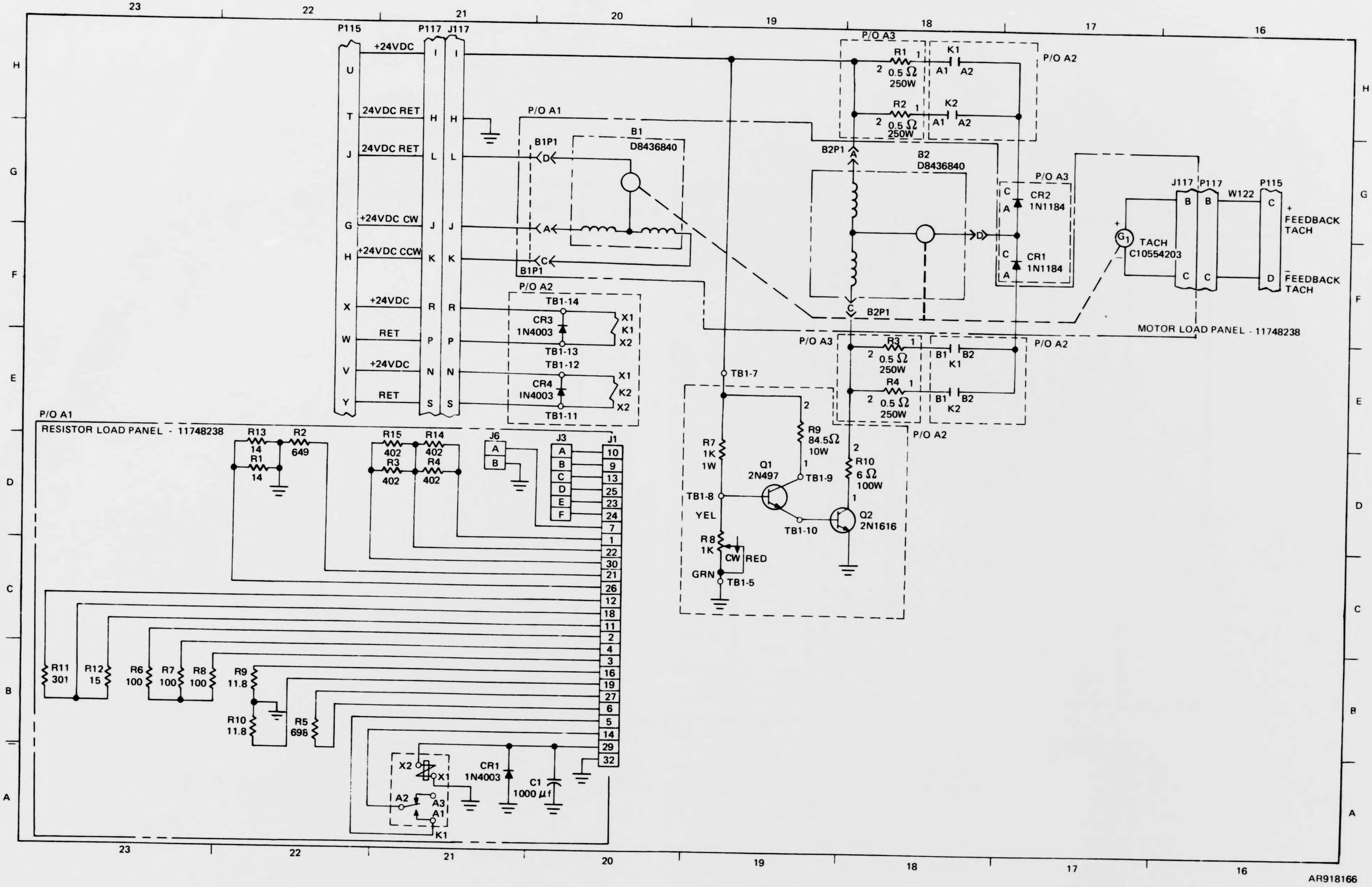
ARR82-28645

Figure FO-11. Inverter/converter test panel 2A2A4 and motor load assembly 2A2A4A1 detailed schematic (sheet 1 of 4).

Change 1


TP15
TP 14
+20 TO +30 V DC
+20 TO +30 V DC RETURN
TP 22
M3
S4A
S4B
S4C
S4D
S4E
S4F
J3
+26V DC
+26V DC RETURN
(T3)
(T2)
(T1)
TP 16
TP 17
TP 18
M4(AC)
S6A
S6B
TO S1B–C (ON SHEET 1)
TO S1C–C (ON SHEET 1)
TP 20
+15V DC
± 15V DC
TP 21
–15V DC
TP 19
+ 19V DC
J4
TP 23
+ 19V DC INPUT
S8A
S8B
S8C
S8D
S8E
M2
TO S3B–C (ON SHEET 1)
S9
TP 22
TO S3A–C (ON SHEET 1)
+20 TO +30 VDC RET
S5A
S5B
S5C
158 Ω ± 1%
10 W
R2
R1
237 Ω ± 1%
5W
S7
TP 13
TP 14
+20 TO +30 VDC
LOAD
PART OF P1
16
19
12
11
18
13
9
10
7
AR918165

FO-11. Inverter/converter test panel 2A2A4 and motor load assembly 2A2A4A1 detailed schematic (sheet 2 of 4).


P115
P117
J117
+24VDC
24VDC RET
24VDC RET
+24VDC CW
+24VDC CCW
+24VDC
RET
+24VDC
RET
U
T
J
G
H
X
W
V
Y
I
H
L
J
K
R
P
N
S
P/O A1
B1P1
B1
D8436840
P/O A2
TB1-14
CR3
1N4003
TB1-13
TB1-12
CR4
1N4003
TB1-11
X1
K1
X2
X1
K2
X2
P/O A3
R1
0.5 Ω
250W
R2
0.5 Ω
250W
K1
K2
A1
A2
P/O A2
B2P1
B2
D8436840
P/O A3
CR2
1N1184
CR1
1N1184
J117
P117
W122
P115
TACH
C10554203
G1
+ FEEDBACK TACH
- FEEDBACK TACH
MOTOR LOAD PANEL - 11748238
P/O A3
R3
0.5 Ω
250W
R4
0.5 Ω
250W
B1
B2
P/O A2
TB1-7
R7
1K
1W
R9
84.5Ω
10W
Q1
2N497
TB1-9
TB1-8
YEL
TB1-10
R10
6 Ω
100W
Q2
2N1616
R8
1K
CW
RED
GRN
TB1-5
P/O A1
RESISTOR LOAD PANEL - 11748238
R13
14
R1
14
R2
649
R15
402
R3
402
R14
402
R4
402
J6
J3
J1
10
9
13
25
23
24
7
1
22
30
21
26
12
18
11
2
4
3
16
19
27
6
5
14
29
32
R11
301
R12
15
R6
100
R7
100
R8
100
R9
11.8
R10
11.8
R5
698
X2
X1
A2
A3
A1
K1
CR1
1N4003
C1
1000 μf
23
22
21
20
19
18
17
16
H
G
F
E
D
C
B
A
AR918166

FO-11. Inverter/converter test panel 2A2A4 and motor load assembly 2A2A4A1 detailed schematic (sheet 3 of 4).

REF DESIG.	ZONE	REF DESIG.	ZONE	REF DESIG.	ZONE	REF DESIG.	ZONE	REF DESIG.	ZONE	REF DESIG.	ZONE
B1	G-20	RK1	A-21	S7	A-10						
B2	G-18	RR1	D-22	S8	E-9,F-9						
G1	G-17	RR2	D-22		G-9,H-9						
M1	H-5	RR3	D-21	S9	D-9						
M2	D-9	RR4	D-21	TP1	F-7						
M3	G-15	RR5	B-22	TP2	H-6						
M4	H-11	RR6	B-23	TP3	F-7						
MCR1	F-17	RR7	B-23	TP4	G-6						
MCR2	G-17	RR8	B-23	TP5	G-6						
MCR3	F-20	RR9	B-22	TP6	G-6						
MCR4	E-20	RR10	B-22	TP7	H-5						
MK1	E-18 F-20	RR11	B-23	TP8	C-6						
	H-18	RR12	B-23	TP9	B-7						
MK2	E-18 E-20	RR13	D-22	TP10	A-6						
	H-18	RR14	D-21	TP11	B-5						
MQ1	D-19	RR15	D-21	TP12	B-6						
MQ2	D-18			TP13	B-9						
MR1	H-18	S1	A-3,B-3	TP14	A-11,H-2						
MR2	H-18		C-3,D-3		H-13						
MR3	E-18		E-3,F-3	TP15	H-14						
MR4	E-18		G-3,H-3	TP16	E-14						
MR7	D-19	S2	C-2,D-2	TP17	E-14						
MR8	D-19	S3	D-5,E-5	TP18	E-14						
MR9	E-19		F-5	TP19	E-10						
MR10	D-18	S4	D-13,E-13	TP20	F-10						
R1	A-10		F-13,G-13	TP21	E-10						
R2	B-10		H-13	TP22	C-11,G-2						
RC1	A-20	S5	B-12,C-12		G-14						
RCR1	A-21	S6	G-11,H-11	TP23	D-11						

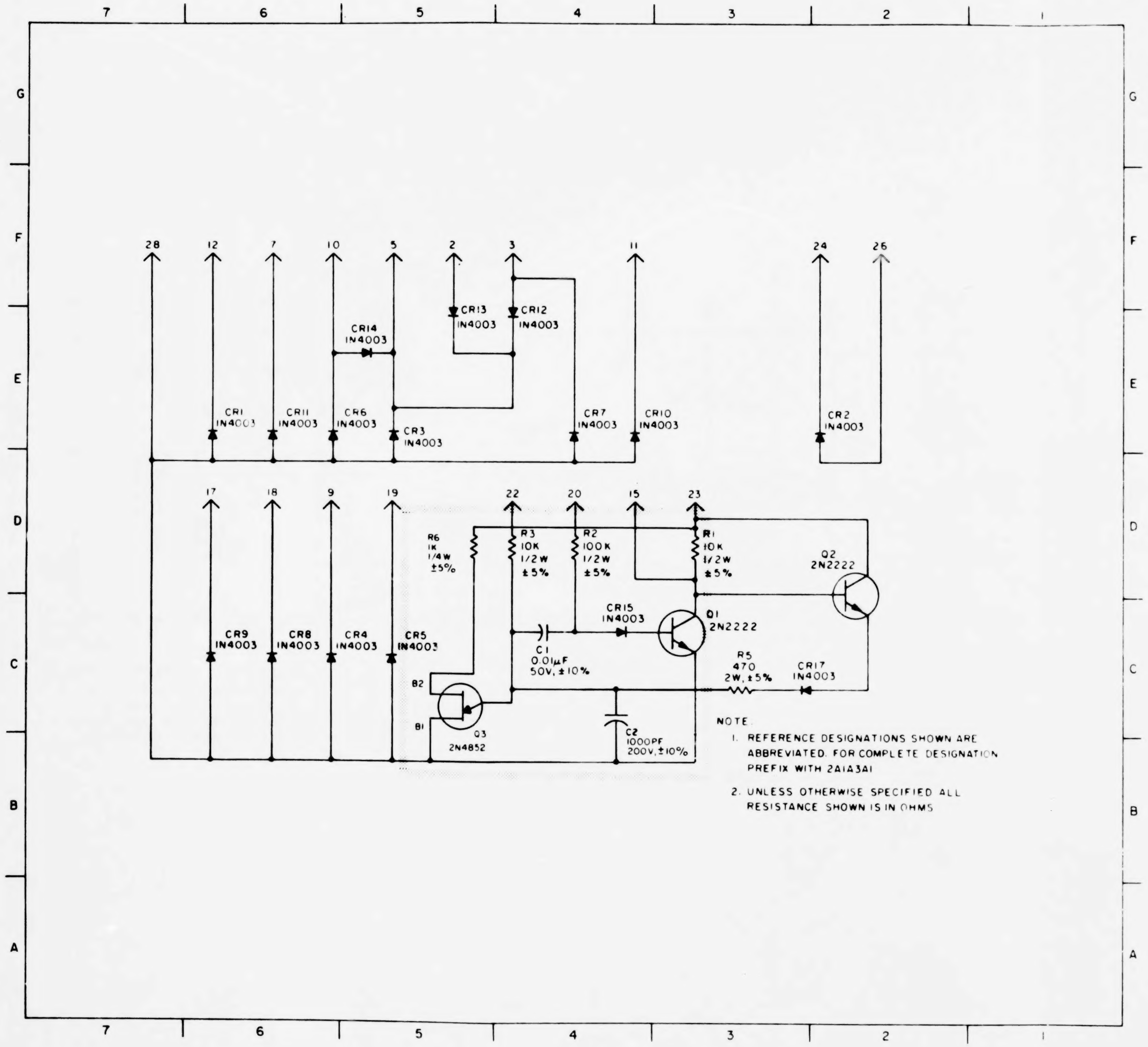
SHEET NO.	ZONE
1	1 THROUGH 7
2	8 THROUGH 15
3	16 THROUGH 23

NOTES:

1. REFERENCE DESIGNATIONS SHOWN ARE ABBREVIATED, FOR COMPLETE DESIGNATION PREFIX WITH 2A2A4 AND 2A2A4A1

AR918167

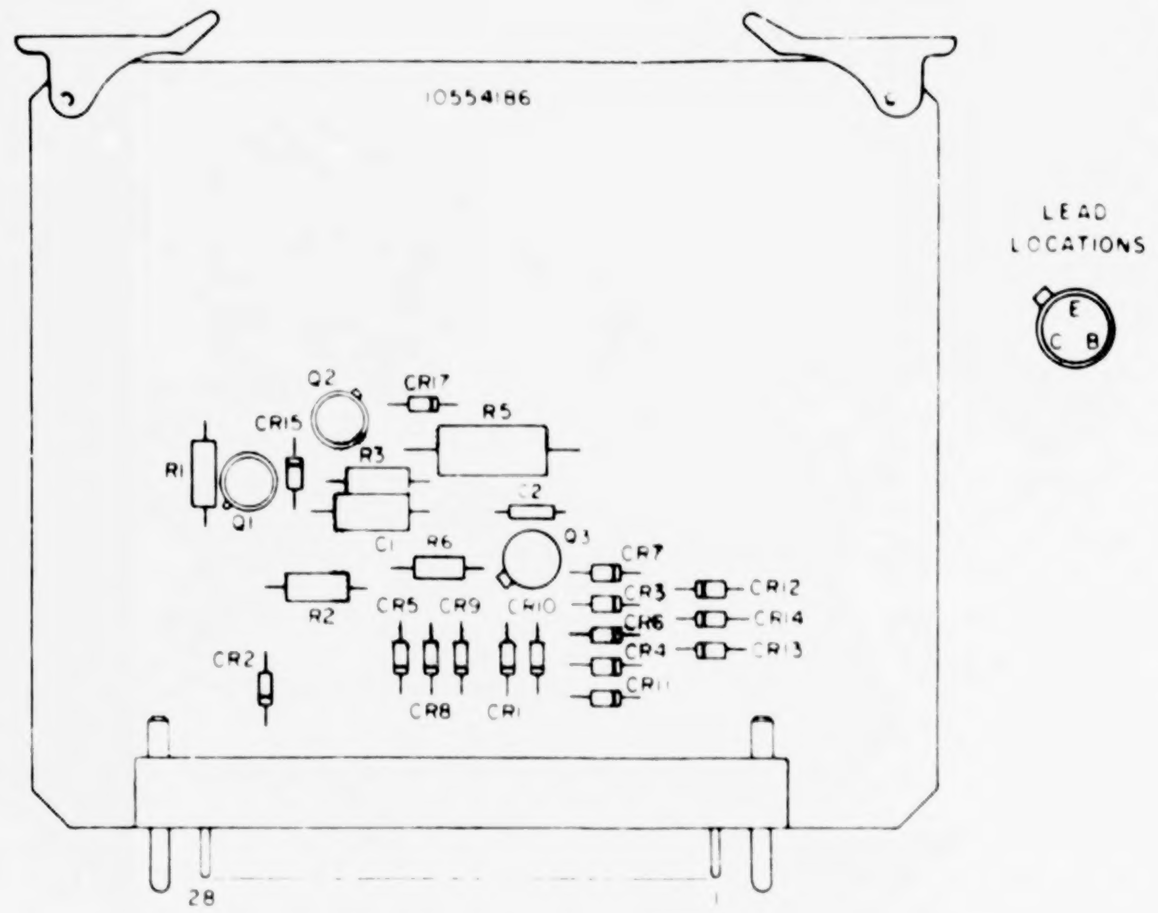
FO-11. Inverter/converter test panel 2A2A4 and motor load assembly 2A2A4A1 detailed schematic (sheet 4 of 4).


7
6
5
4
3
2
1
G
F
E
D
C
B
A
28
12
7
10
5
2
3
11
24
26
CR13
IN4003
CR12
IN4003
CR14
IN4003
CR1
IN4003
CR11
IN4003
CR6
IN4003
CR3
IN4003
CR7
IN4003
CR10
IN4003
CR2
IN4003
17
18
9
19
22
20
15
23
R6
1K
1/4W
±5%
R3
10K
1/2W
±5%
R2
100K
1/2W
±5%
R1
10K
1/2W
±5%
Q2
2N2222
CR15
IN4003
Q1
2N2222
CR9
IN4003
CR8
IN4003
CR4
IN4003
CR5
IN4003
C1
0.01µF
50V, ±10%
R5
470
2W, ±5%
CR17
IN4003
B2
B1
Q3
2N4852
C2
1000PF
200V, ±10%

NOTE

1. REFERENCE DESIGNATIONS SHOWN ARE ABBREVIATED. FOR COMPLETE DESIGNATION PREFIX WITH 2A1A3A1
2. UNLESS OTHERWISE SPECIFIED ALL RESISTANCE SHOWN IS IN OHMS

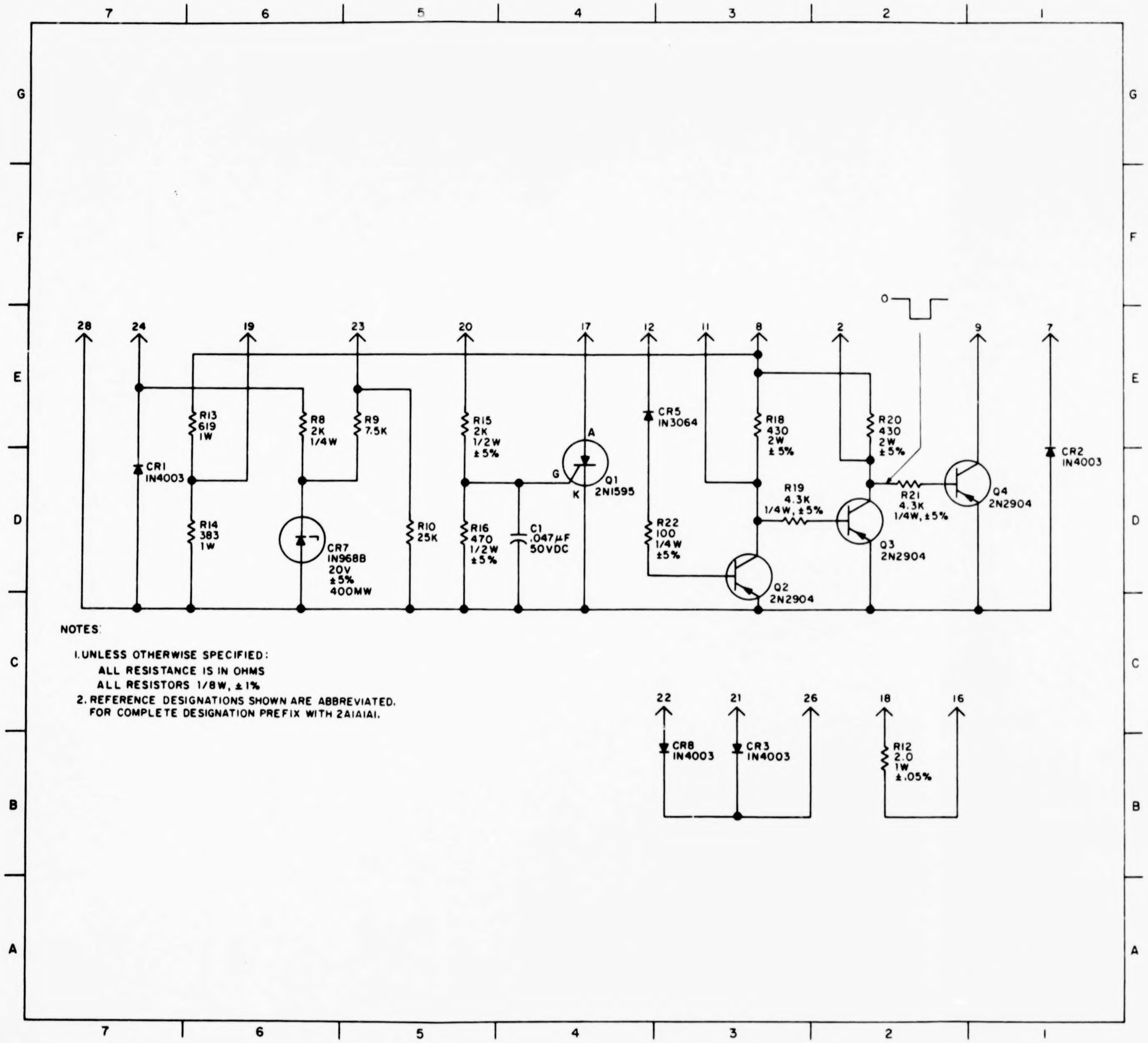
REFERENCE DESIGNATION	ZONE
R1	D 3
R2	D 4
R3	D 4
R5	C 3
▩ R6	D 5
Q1	C 3
Q2	D 2
▩ Q3	B 5
C1	C 4
▩ C2	C 3
CR1	E 6
CR2	E 2
CR3	E 5
CR4	C 6
CR5	C 5
CR6	E 6
CR7	E 4
CR8	C 6
CR9	C 6
CR10	E 4
CR11	E 6
CR12	E 4
CR13	E 5
CR14	E 5
CR15	C 4
CR17	C 3


10554186
Q2
CR17
R5
CR15
R1
R3
Q1
C2
C1
R6
Q3
CR7
R2
CR5
CR9
CR10
CR3
CR12
CR6
CR14
CR4
CR13
CR2
CR11
CR8
CR1
28
1
LEAD LOCATIONS
E
C
B

TESTOR INPUTS	TEST AND (PINS)														
	B11	B12	B13	B14	B15	B16	B17	B18	B19	B20	B21	B22	B23	B24	B25
RESET OFF OPEN CKT ON GROUND		12 (10)													
+24.5 to +25.5 VDC THROUGH MATRIX 1+1.1K			19 (17)		11 (9)		9 (7)		5 (3)				44 (24)		
+24.5 to +25.5 VDC THROUGH MATRIX 2+1.1K			38 (18)		39 (19)		14 (12)		13 (11)						
GROUND	25, 26 (28)		25, 26 (28)	25, 26 (28)	25, 26 (28)	25, 26 (28)	25, 26 (28)	25, 26 (28)	25, 26 (28)	25, 26 (28)			46 (26)	46 (26)	12 (10)
24.5 to 25.5 VDC THROUGH MATRIX 1 - 1.1K		7 (5)		19 (17)		11 (9)		9 (7)		5 (3)				44 (24)	
24.5 to 25.5 VDC THROUGH MATRIX 2 - 1.1K				38 (18)		39 (19)		14 (12)		13 (11)					26 (28)
+24.5 to +25.5 VDC	43 (23)										7 (5)				
+24.5 to +25.5 VDC THROUGH MATRIX 1 + 11.1K	42 (22)														
+24.5 to +25.5 VDC THROUGH MATRIX 2 - 100	40 (20)														
+22 to +30 VDC THROUGH MATRIX 2 + 1.1K		26 (28)													7 (5)
24.5 to 25.5 VDC												7 (5)			
MATRIX 1 TO GROUND - 1.1K											5 (3)	5 (3)			
MATRIX 2 TO GROUND - 1.1K											4 (2)	4 (2)			

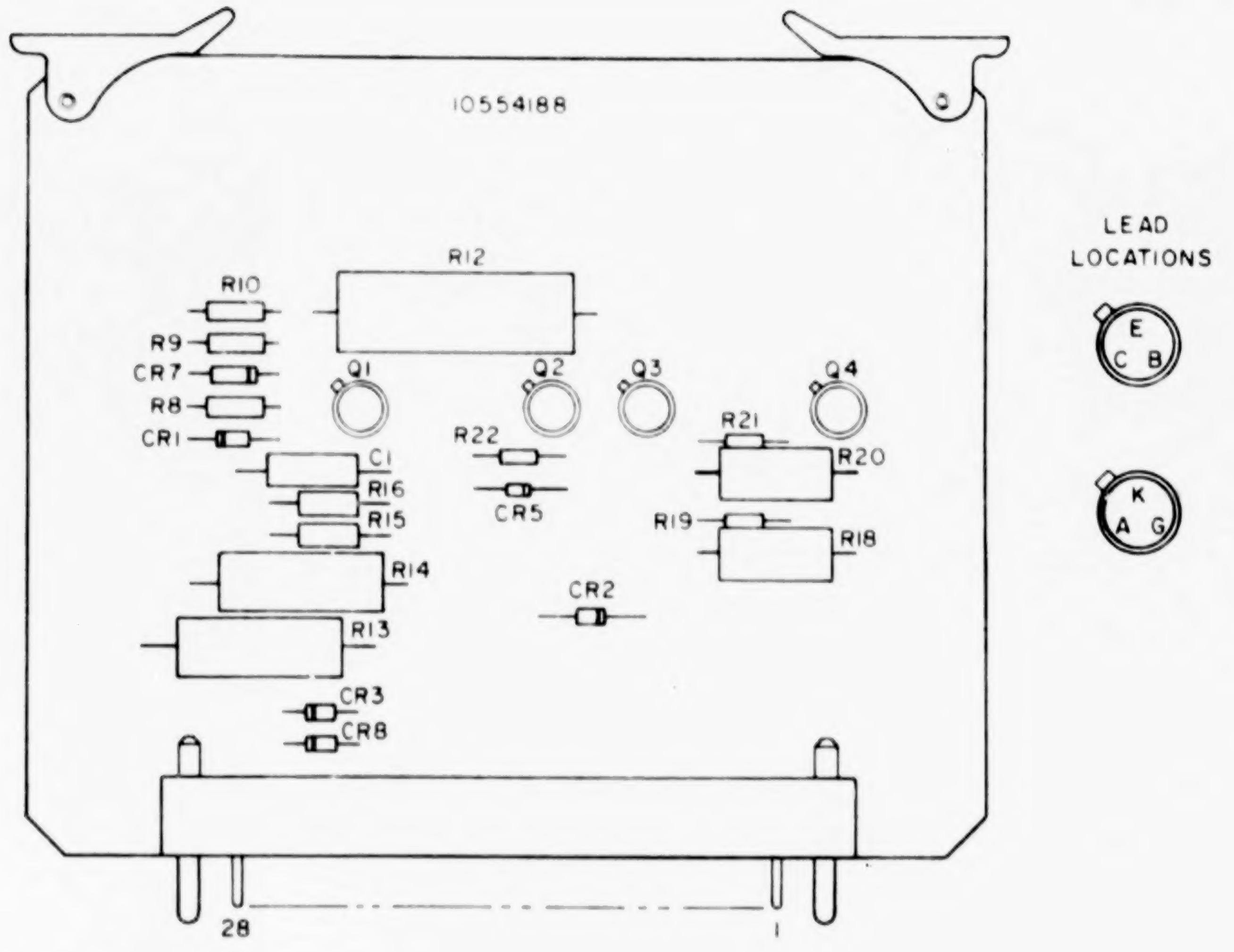
ARR82-28646

Figure FO-12. Power panel circuit card 2A1A3A1 (10554186) detailed schematic and component layout.


7
6
5
4
3
2
1
G
F
E
D
C
B
A
28
24
19
23
20
17
12
11
8
2
9
7
0
R13
619
1W
CR1
1N4003
R14
383
1W
R8
2K
1/4W
CR7
1N968B
20V
±5%
400MW
R9
7.5K
R10
25K
R15
2K
1/2W
±5%
R16
470
1/2W
±5%
C1
.047μF
50VDC
A
G
K
Q1
2N1595
CR5
1N3064
R22
100
1/4W
±5%
Q2
2N2904
R18
430
2W
±5%
R19
4.3K
1/4W, ±5%
Q3
2N2904
R20
430
2W
±5%
R21
4.3K
1/4W, ±5%
Q4
2N2904
CR2
1N4003
22
21
26
18
16
CR8
1N4003
CR3
1N4003
R12
2.0
1W
±.05%

NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTANCE IS IN OHMS
   ALL RESISTORS 1/8W, ±1%
2. REFERENCE DESIGNATIONS SHOWN ARE ABBREVIATED. FOR COMPLETE DESIGNATION PREFIX WITH 2A1A1A1.

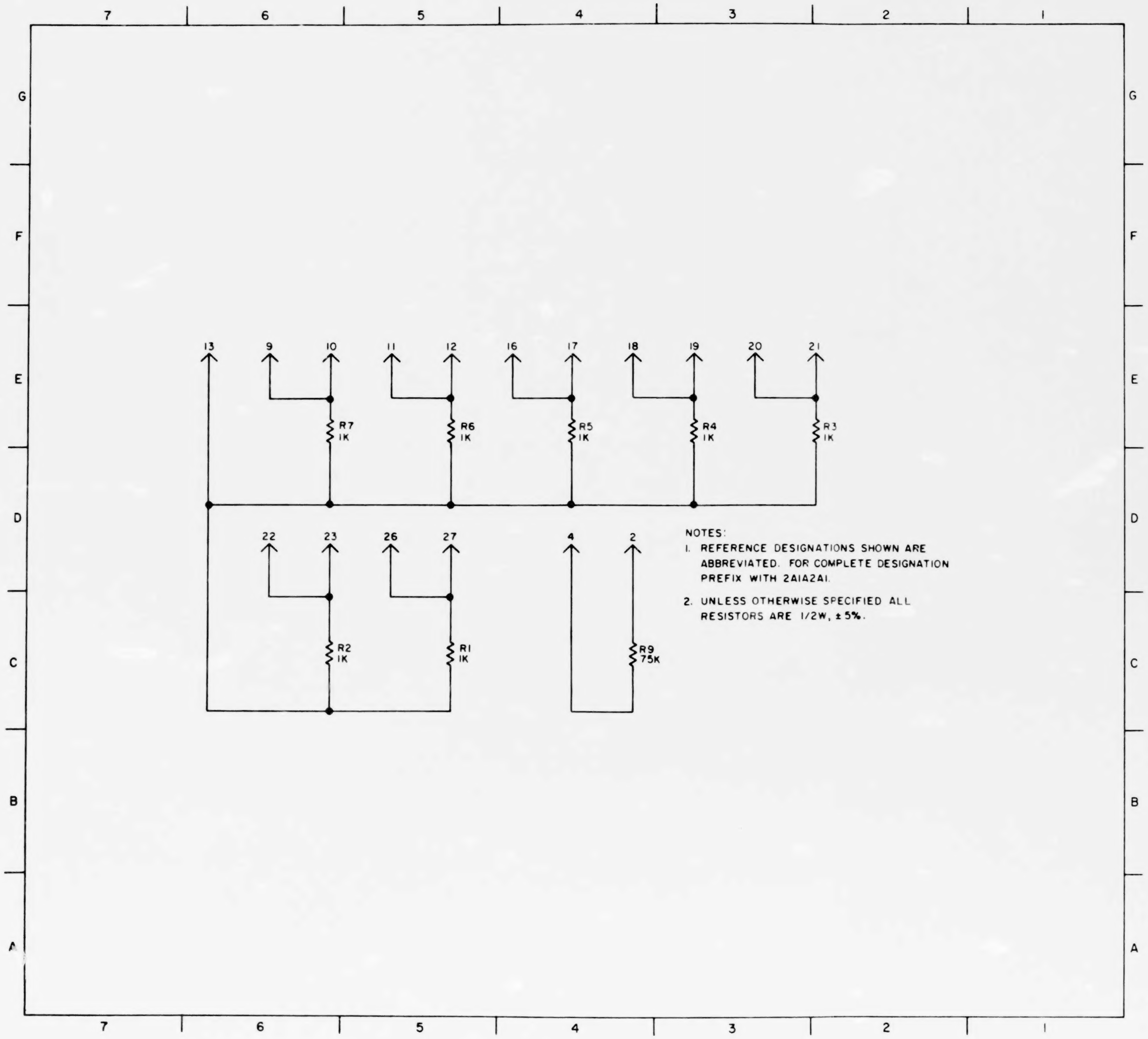

10554188
R10
R9
CR7
R8
CR1
R12
Q1
Q2
Q3
Q4
R22
CR5
C1
R16
R15
R14
R13
CR3
CR8
CR2
R21
R20
R19
R18
28
1
LEAD LOCATIONS
E
C
B
K
A
G

REFERENCE DESIGNATION	ZONE
R8	E6
R9	E5
R10	D5
R12	B2
R13	E6
R14	D6
R15	E5
R16	D5
R18	E3
R19	D3
R20	E2
R21	D2
R22	D4
Q1	D4
Q2	D3
Q3	D2
Q4	D2
C1	D4
CR1	D7
CR2	D1
CR3	B3
CR5	E4
CR7	D6
CR8	B3

TESTOR INPUTS	TEST AND (PINS)				
	B6	B7	B8	B9	B10
+24.5 to +25.5 VDC	43 (23)			44 (24)	
24.5 to -25.5 VDC	10 (8)				
+22 to +28 VDC THROUGH MATRIX 1 + 1.1K		24 (28)		9 (7)	26 (28)
GROUND	24,25 (28)	44,46 (24),(26)	24,25 (28)	41,26 (21),(28)	46 (26)
-24.5 to 25.5 VDC THROUGH MATRIX 1 + 1.1K	11 (9)				
SIGNAL GENERATOR	14 (12)				
TEST 1 +22 to 28 VDC THROUGH MATRIX 2 + 100 Ω 2 OPEN CKT -			19 (17)		
RESET OFF OPEN CKT - ON +22 to +28 VDC THROUGH MATRIX 1 + 100 Ω			40 (20)		
+24.5 to +25.5 VDC THROUGH MATRIX 1 + 1.1K		42 (22)		46 (26)	
+24.5 to +25.5 VDC THROUGH MATRIX 2 + 1.1K				9 (7)	
15 VDC THROUGH MATRIX 2 + 1.1K					42 (22)
JUMPER CONNECTION					9, 41 (7), (21)

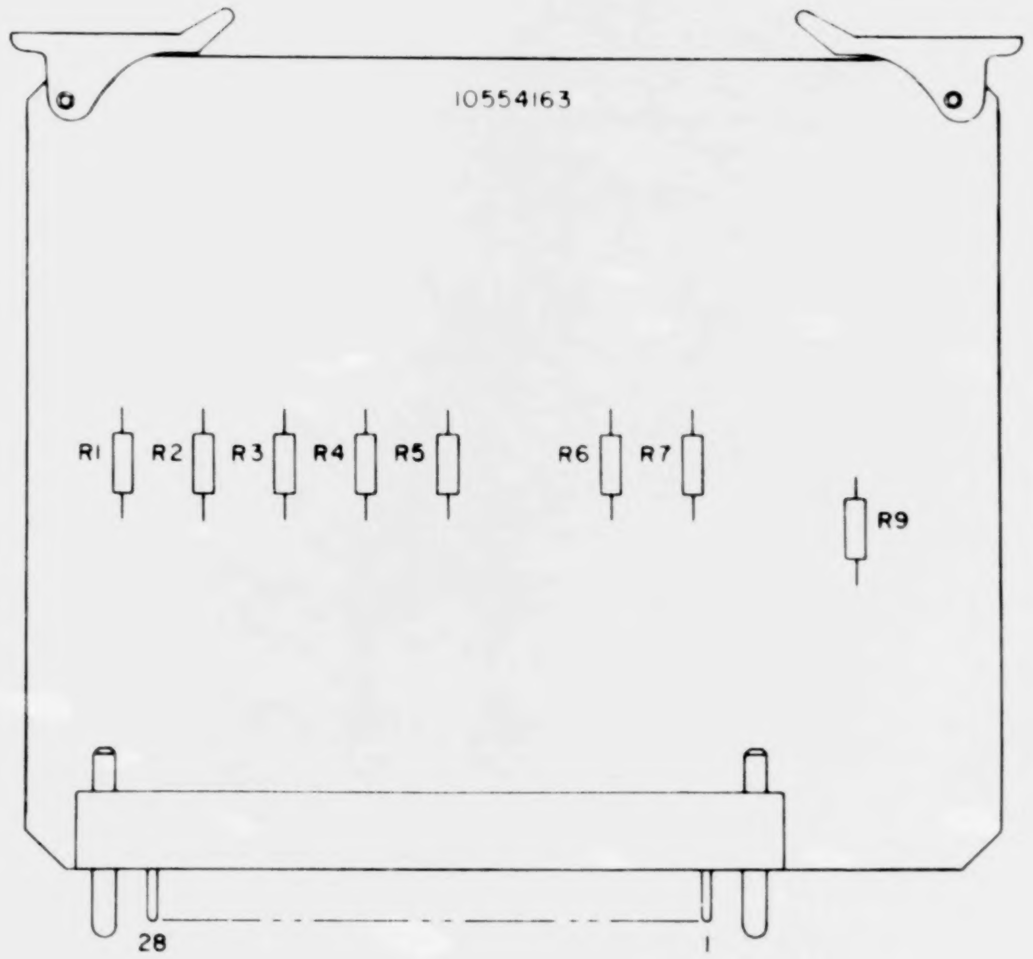
AR904854

FO-13. Sight current generator circuit card 2A1A1A1 (10554188), detailed schematic and component layout


7
6
5
4
3
2
1
G
F
E
D
C
B
A
13
9
10
11
12
16
17
18
19
20
21
R7
1K
R6
1K
R5
1K
R4
1K
R3
1K
22
23
26
27
4
2
R2
1K
R1
1K
R9
75K

NOTES:

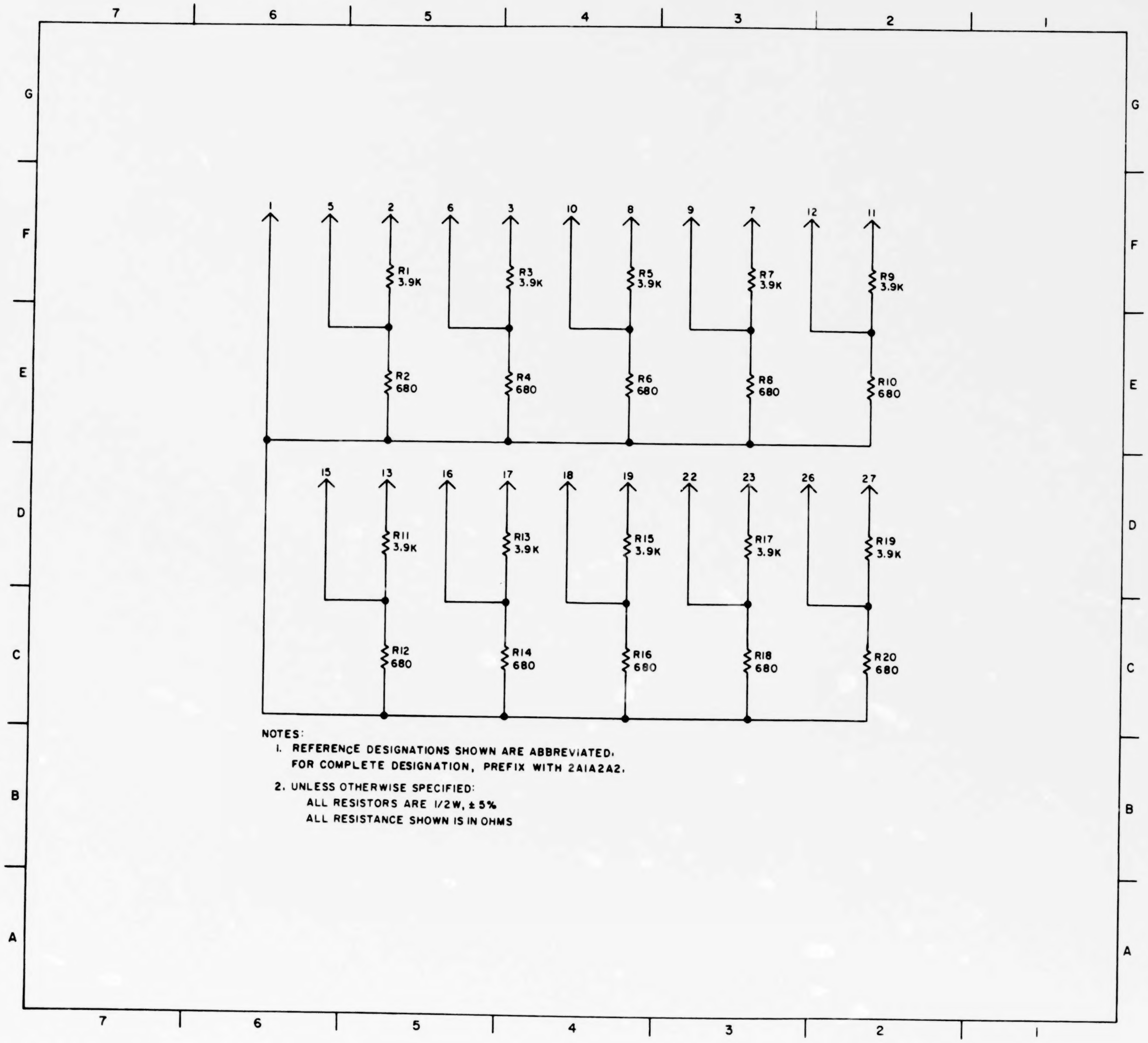
1. REFERENCE DESIGNATIONS SHOWN ARE ABBREVIATED. FOR COMPLETE DESIGNATION PREFIX WITH 2A1A2A1.
2. UNLESS OTHERWISE SPECIFIED ALL RESISTORS ARE 1/2W, ±5%.


10554163
R1
R2
R3
R4
R5
R6
R7
R9
28
1

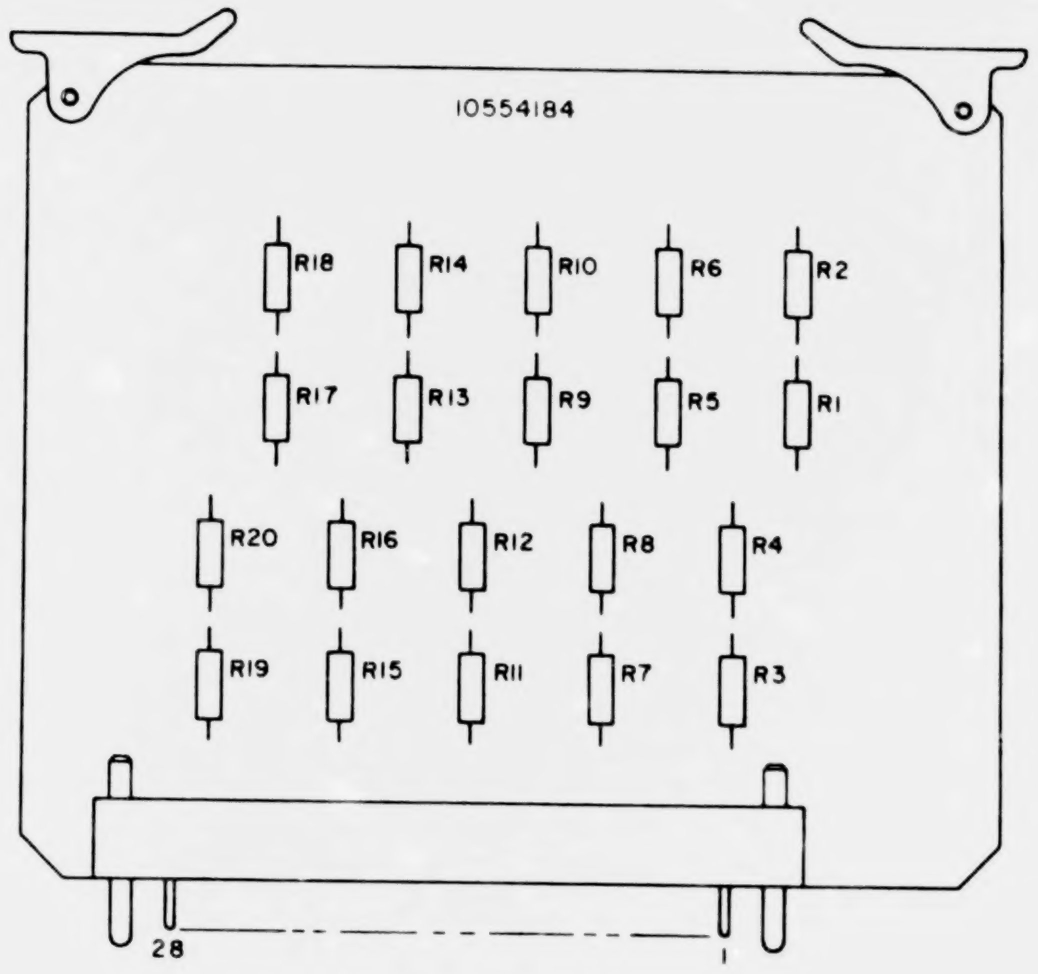
REFERENCE DESIGNATION	ZONE
R1	C5
R2	C6
R3	E2
R4	E3
R5	E4
R6	E5
R7	E6
R9	C4

AR904853

FO-14. Logic function resistors circuit card 2A1A2A1 (10554163), detailed schematic and component layout


1
5
2
6
3
10
8
9
7
12
11
R1 3.9K
R3 3.9K
R5 3.9K
R7 3.9K
R9 3.9K
R2 680
R4 680
R6 680
R8 680
R10 680
15
13
16
17
18
19
22
23
26
27
R11 3.9K
R13 3.9K
R15 3.9K
R17 3.9K
R19 3.9K
R12 680
R14 680
R16 680
R18 680
R20 680
G
F
E
D
C
B
A
7
6
5
4
3
2
1

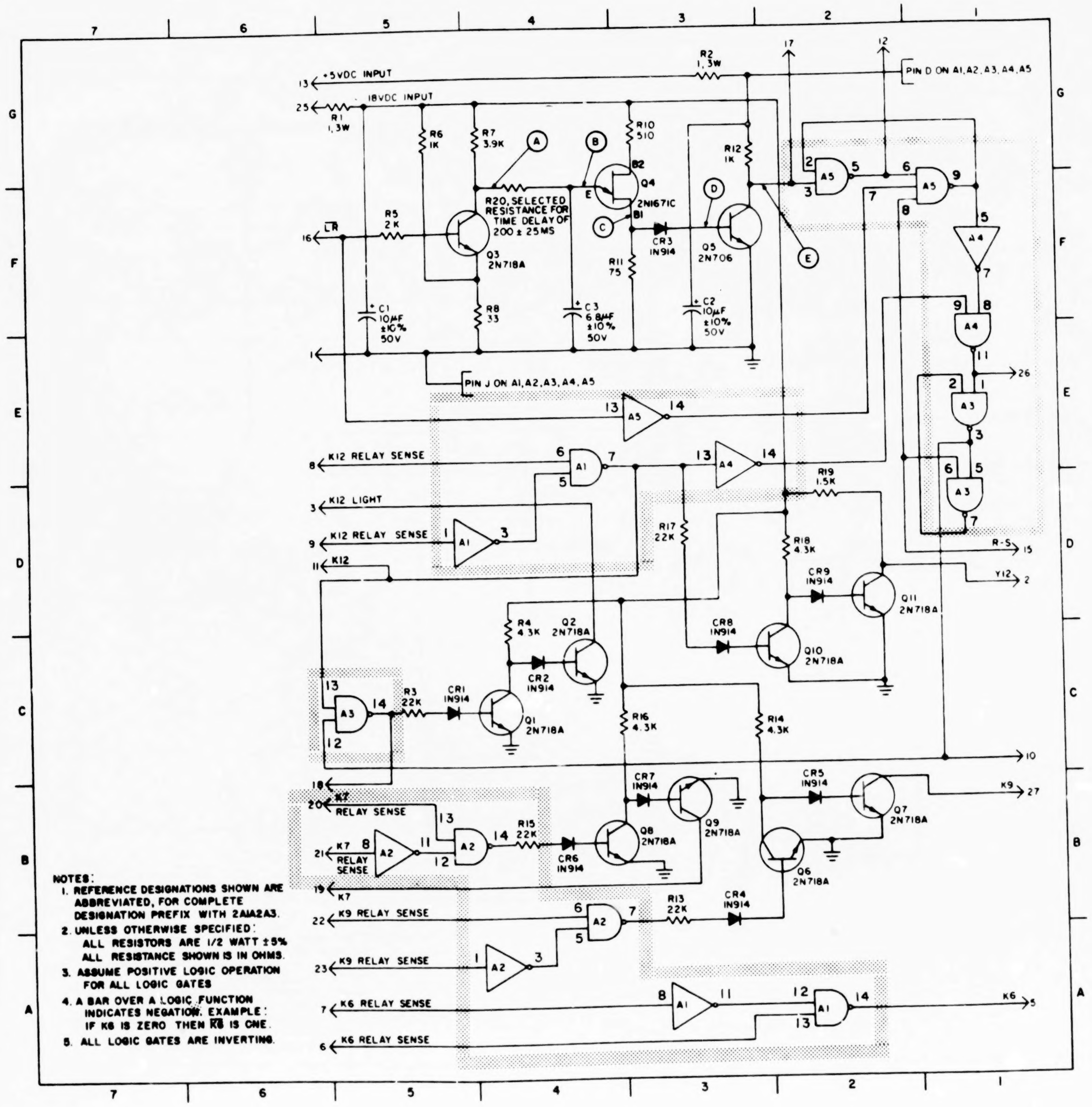
NOTES:
1. REFERENCE DESIGNATIONS SHOWN ARE ABBREVIATED. FOR COMPLETE DESIGNATION, PREFIX WITH 2A1A2A2.
2. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTORS ARE 1/2W, ± 5%
   ALL RESISTANCE SHOWN IS IN OHMS


10554184
R18
R14
R10
R6
R2
R17
R13
R9
R5
R1
R20
R16
R12
R8
R4
R19
R15
R11
R7
R3
28
1

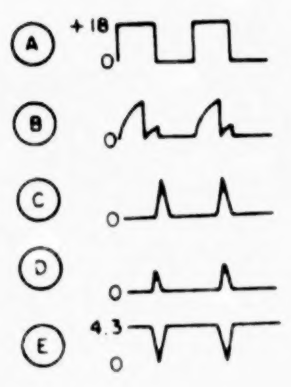
REFERENCE DESIGNATION	ZONE
R1	F5
R2	E5
R3	F4
R4	E4
R5	F4
R6	E4
R7	F3
R8	E3
R9	F2
R10	E2
R11	D5
R12	C5
R13	D4
R14	C4
R15	D4
R16	C4
R17	D3
R18	C3
R19	D2
R20	C2

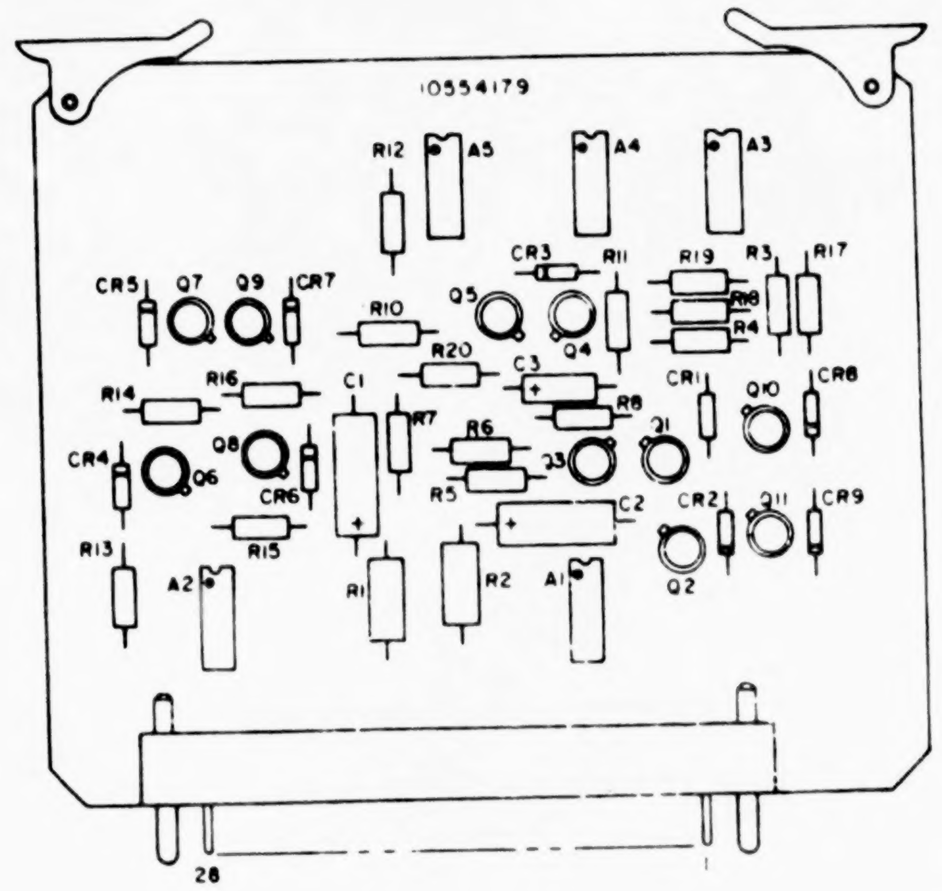
AR904852

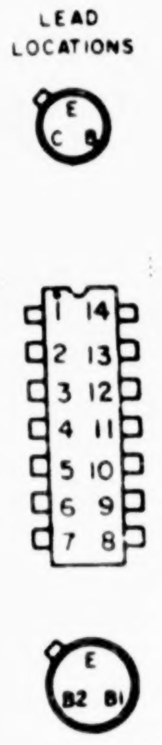
FO-15. Relay sense resistors circuit card 2A1A2A2 (10554184), detailed schematic and component layout


+5VDC INPUT
18VDC INPUT
R1 1, 3W
R2 1, 3W
PIN D ON A1, A2, A3, A4, A5
PIN J ON A1, A2, A3, A4, A5
R6 1K
R7 3.9K
R10 510
R12 1K
R5 2K
R8 33
R11 75
R20, SELECTED RESISTANCE FOR TIME DELAY OF 200 ± 25MS
Q3 2N718A
Q4 2N1671C
Q5 2N706
CR3 1N914
C1 10µF ±10% 50V
C3 6.8µF ±10% 50V
C2 10µF ±10% 50V
LR
K12 RELAY SENSE
K12 LIGHT
K12
R19 1.5K
R17 22K
R18 4.3K
CR9 1N914
Q11 2N718A
R4 4.3K
Q2 2N718A
CR2 1N914
CR8 1N914
Q10 2N718A
R3 22K
CR1 1N914
Q1 2N718A
R16 4.3K
R14 4.3K
CR7 1N914
Q9 2N718A
CR5 1N914
Q7 2N718A
K7 RELAY SENSE
R15 22K
CR6 1N914
Q8 2N718A
Q6 2N718A
K9 RELAY SENSE
R13 22K
CR4 1N914
K6 RELAY SENSE
K6
K9
R-5
Y12

NOTES:
1. REFERENCE DESIGNATIONS SHOWN ARE ABBREVIATED, FOR COMPLETE DESIGNATION PREFIX WITH 2A1A2A3.
2. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTORS ARE 1/2 WATT ±5%
   ALL RESISTANCE SHOWN IS IN OHMS.
3. ASSUME POSITIVE LOGIC OPERATION FOR ALL LOGIC GATES
4. A BAR OVER A LOGIC FUNCTION INDICATES NEGATION. EXAMPLE: IF K6 IS ZERO THEN $\overline{K6}$ IS ONE.
5. ALL LOGIC GATES ARE INVERTING.


A
+18
0
B
C
D
E
4.3
0


10554179
28


LEAD LOCATIONS
E
C
B
B2
B1

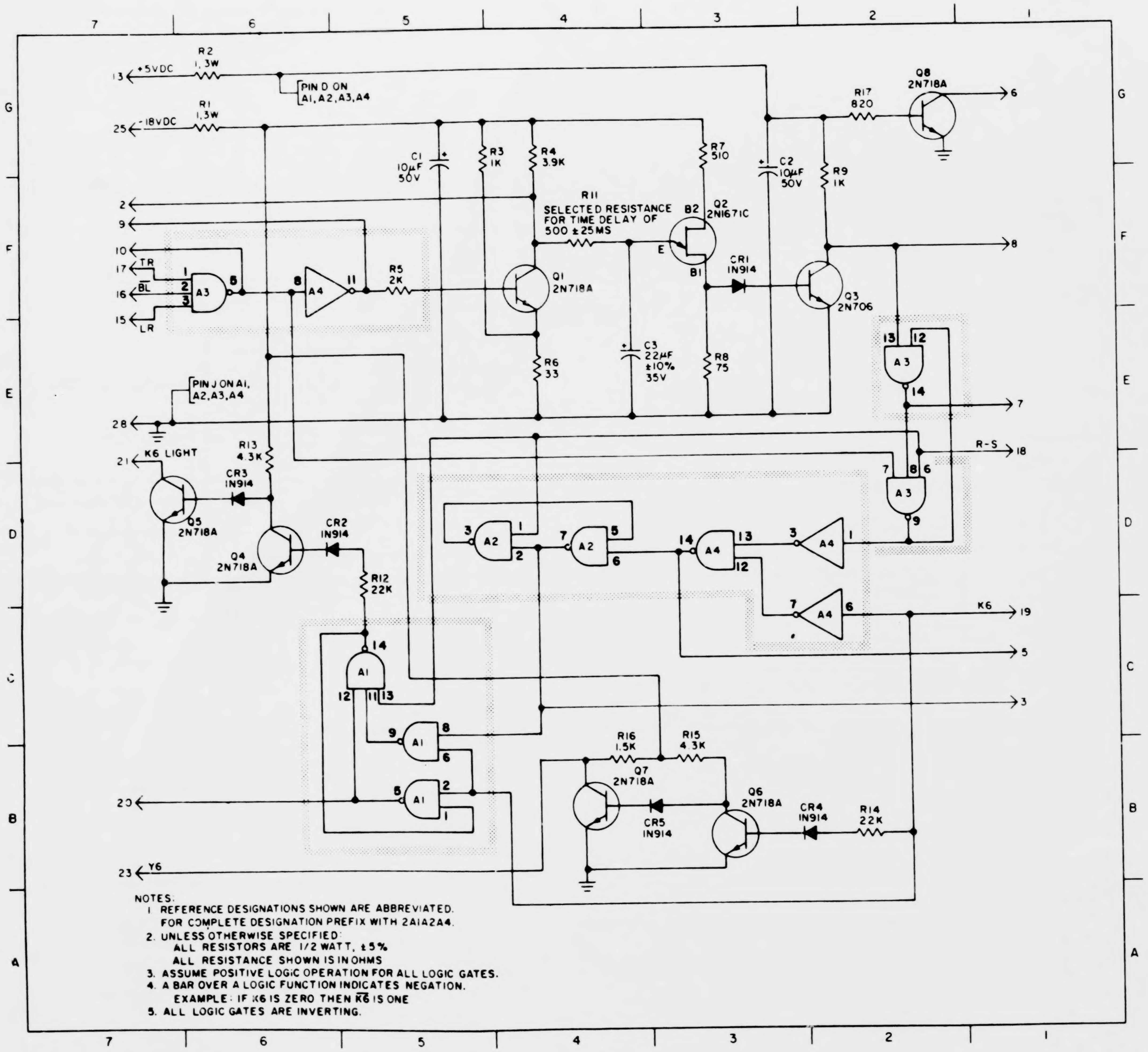
REFERENCE DESIGNATION	ZONE	REFERENCE DESIGNATION	ZONE
R1	G-5	Q6	B-2
R2	G-3	Q7	B-2
R3	C-5	Q8	B-4
R4	D-4	Q9	B-3
R5	F-5	Q10	C-2
R6	G-5	Q11	D-2
R7	G-4	C1	F-5
R8	F-4	C2	F-4
R10	G-3	C3	F-3
R11	F-3	CR1	C-5
R12	G-3	CR2	C-4
R13	B-3	CR3	F-3
R14	C-3	CR4	B-3
R15	B-4	CR5	B-2
R16	C-3	CR6	B-4
R17	D-3	CR7	B-3
R18	D-2	CR8	C-3
R19	D-2	CR9	D-2
R20	F-4	A1	A-3, A-2, D-5, & E-4
Q1	C-4	A2	A-4 & B-5
Q2	C-4	A3	D-1, E-1 & C-5
Q3	F-4	A4	F-1, E-1 & E-3
Q4	F-3	A5	F-1, F-2 & E-3
Q5	F-3		

TESTOR INPUTS		TESTS AND (PINS)	
		A 247	A 248
+18.4 to 19.4 VDC THROUGH 1.43 K		39, 47 (19) (27)	5 (3)
+18.4 to +19.4 VDC		45 (25)	45 (25)
SIGNAL GENERATOR		9, 11, 41, 43 (7), (9), (21), (23)	11 18 (9) (16)
GROUND		26 (1)	26 (1)
+5 VDC		30 (13)	30 (13)
RESET	ON GROUND	8, 10, 40, 42	17
	OFF +2.5 to 5 VDC	(6), (8), (20), (22)	(15)

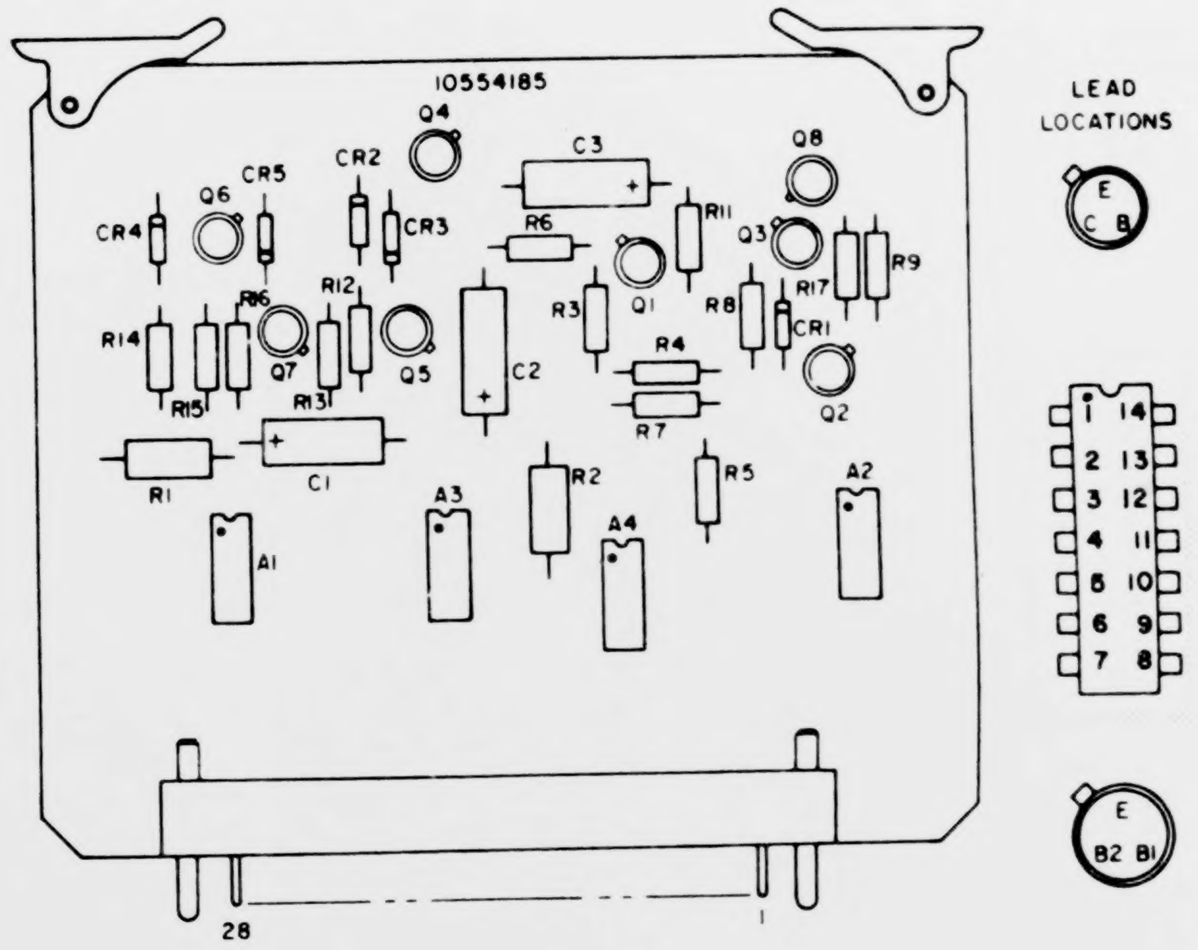
ARR82-28647

Figure FO-16. Relay sense and K12 operation circuit card 2A1A2A3 (10554179), detailed schematic and component layout

Change 1


7
6
5
4
3
2
1
G
F
E
D
C
B
A
13
+5VDC
R2
1, 3W
PIN D ON
A1, A2, A3, A4
25
-18VDC
R1
1,3W
C1
10μF
50V
R3
1K
R4
3.9K
R7
510
C2
10μF
50V
R9
1K
R17
820
Q8
2N718A
6
2
9
10
17
TR
16
BL
15
LR
A3
A4
R5
2K
R11
SELECTED RESISTANCE FOR TIME DELAY OF 500 ± 25MS
Q1
2N718A
B2
Q2
2N1671C
E
B1
CR1
IN914
Q3
2N706
8
C3
22μF
±10%
35V
R6
33
R8
75
PIN J ON A1, A2, A3, A4
28
21
K6 LIGHT
R13
4.3K
CR3
IN914
Q5
2N718A
Q4
2N718A
CR2
IN914
R12
22K
A2
A4
A3
7
R-S
18
K6
19
5
3
A1
20
R16
1.5K
R15
4.3K
Q7
2N718A
CR5
IN914
Q6
2N718A
CR4
IN914
R14
22K
23
Y6

NOTES:
1. REFERENCE DESIGNATIONS SHOWN ARE ABBREVIATED. FOR COMPLETE DESIGNATION PREFIX WITH 2A1A2A4.
2. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTORS ARE 1/2 WATT, ±5%
   ALL RESISTANCE SHOWN IS IN OHMS
3. ASSUME POSITIVE LOGIC OPERATION FOR ALL LOGIC GATES.
4. A BAR OVER A LOGIC FUNCTION INDICATES NEGATION.
   EXAMPLE: IF K6 IS ZERO THEN $\overline{K6}$ IS ONE
5. ALL LOGIC GATES ARE INVERTING.

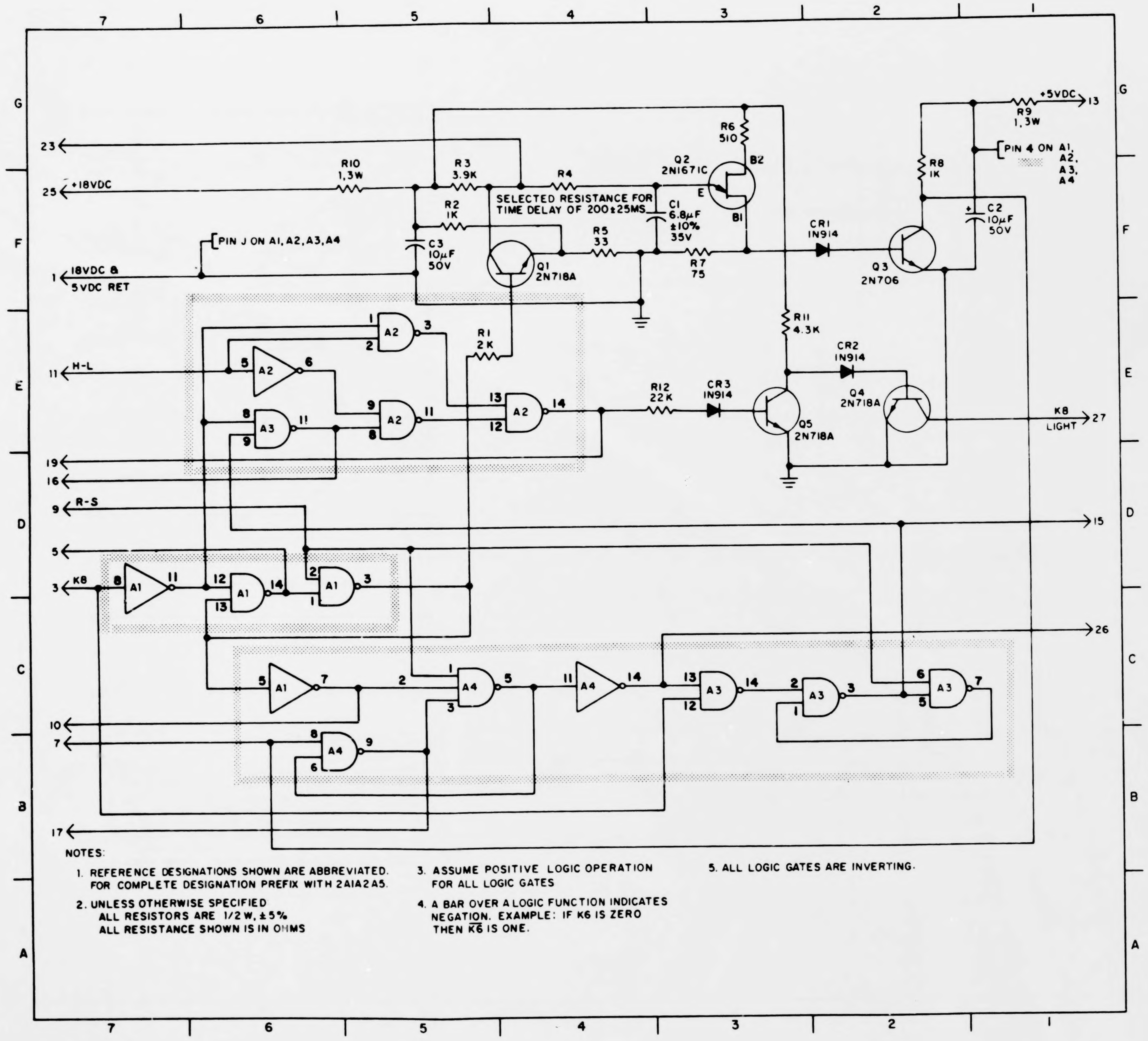

10554185
Q4
C3
Q8
CR5
CR2
Q6
CR3
CR4
R6
R11
Q3
R17
R9
R16
R12
R3
Q1
R8
CR1
R14
Q7
Q5
C2
R4
Q2
R15
R13
R7
R1
C1
R2
R5
A2
A3
A4
A1
28
1
LEAD LOCATIONS
E
C
B
1
2
3
4
5
6
7
14
13
12
11
10
9
8
E
B2
B1

REFERENCE DESIGNATION	ZONE	REFERENCE DESIGNATION	ZONE
R1	G 6	Q3	F 2
R2	G-6	Q4	D 6
R3	G 5	Q5	D 7
R4	G-4	Q6	B 3
R5	F-5	Q7	B 4
R6	E 4	Q8	G 2
R7	G 3	C1	G 5
R8	E 3	C2	F 3
R9	F 2	C3	E 4
R11	F 4	CR1	F 3
R12	D 5	CR2	D 6
R13	E 6	CR3	D 6
R14	B 2	CR4	B 2
R15	B 3	CR5	B 3
R16	B 4	A1	C 5 & B 5
R17	G 2	A2	D 4
Q1	F 4	A3	E 2, D 2, & F 6
Q2	F 3	A4	D 3, D 2, C 2, & F 6

TESTOR INPUTS	TESTS AND (PINS)		
	A 249	A 250	A 251
+18 4 to 19 4 VDC	45 (25)	45 (25)	45 (25)
+18 4 to 19 4 VDC THROUGH 1 43K	41 (21)	41 (21)	41 (21)
+5 VDC	30 (13)	30 (13)	30 (13)
GROUND	26 (28)	26 (28)	26 (28)
RESET OFF +2 5 to 5 0 VDC ON GROUND	38 (18)	38 (18)	38 (18)
SIGNAL GENERATOR	19, 39 (17),(19)	39 (19)	39 (19)
TEST 1 +2 5 to 5 0 VDC 2 GROUND		18 (16)	17 (15)

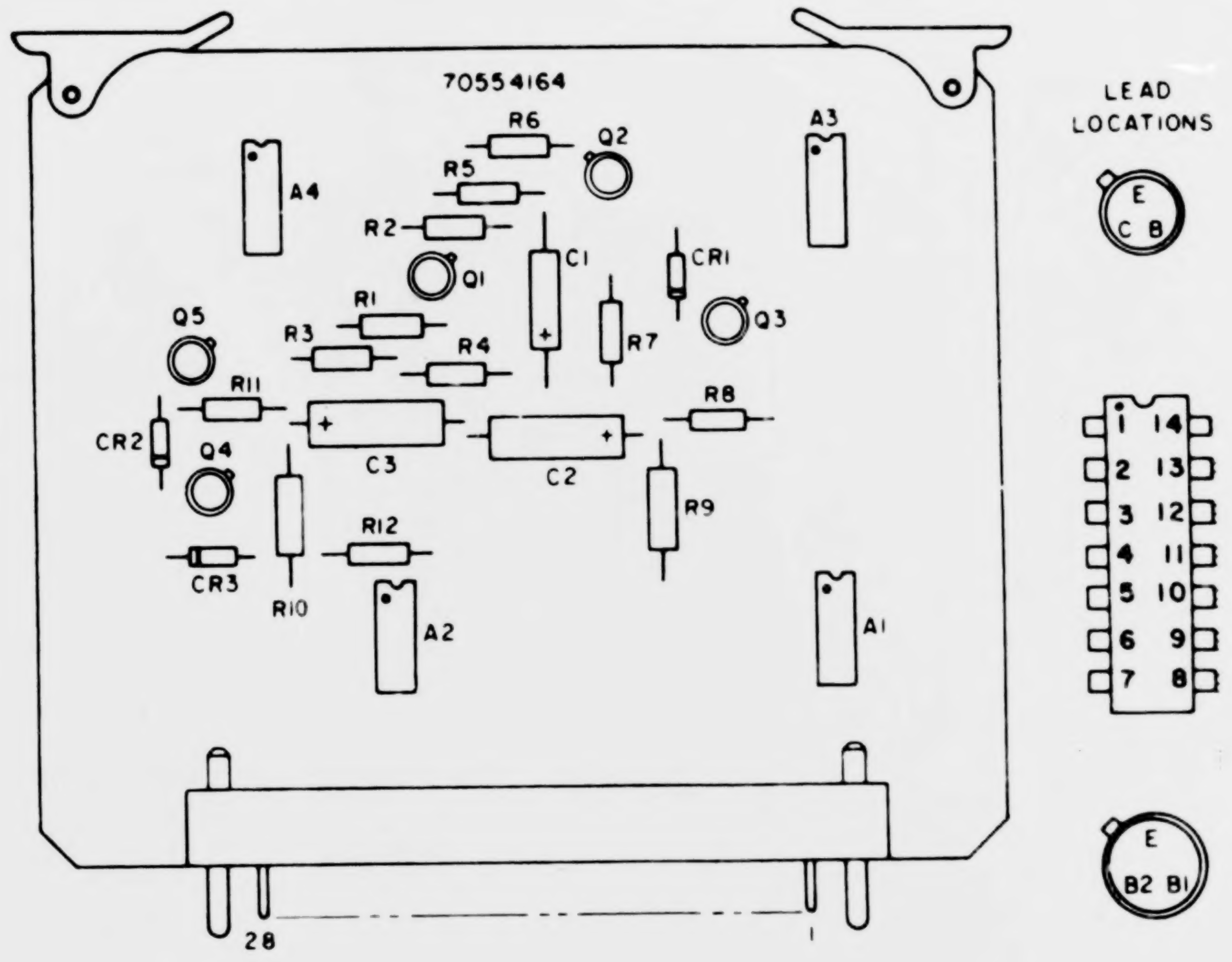
ARR82-28648

Figure FO-17. K6 operation and sequence circuit card 2A1A2A4 (10554185), detailed schematic and component layout


23
25
+18VDC
PIN J ON A1, A2, A3, A4
1
18VDC &
5VDC RET
11
H-L
19
16
9
R-S
5
3
K8
10
7
17
R10
1,3W
R3
3.9K
R4
R2
1K
SELECTED RESISTANCE FOR
TIME DELAY OF 200±25MS
C3
10μF
50V
Q1
2N718A
R5
33
C1
6.8μF
±10%
35V
R7
75
Q2
2N1671C
R6
510
B2
B1
E
CR1
IN914
R8
1K
R9
1,3W
+5VDC
13
PIN 4 ON A1, A2, A3, A4
C2
10μF
50V
Q3
2N706
R11
4.3K
CR2
IN914
Q4
2N718A
K8
LIGHT
27
R1
2K
R12
22K
CR3
IN914
Q5
2N718A
15
26
A1
A2
A3
A4
G
F
E
D
C
B
A
7
6
5
4
3
2
1

NOTES:

1. REFERENCE DESIGNATIONS SHOWN ARE ABBREVIATED. FOR COMPLETE DESIGNATION PREFIX WITH 2A1A2A5.
2. UNLESS OTHERWISE SPECIFIED
   ALL RESISTORS ARE 1/2W, ±5%
   ALL RESISTANCE SHOWN IS IN OHMS
3. ASSUME POSITIVE LOGIC OPERATION FOR ALL LOGIC GATES
4. A BAR OVER A LOGIC FUNCTION INDICATES NEGATION. EXAMPLE: IF K6 IS ZERO THEN $\overline{K6}$ IS ONE.
5. ALL LOGIC GATES ARE INVERTING.

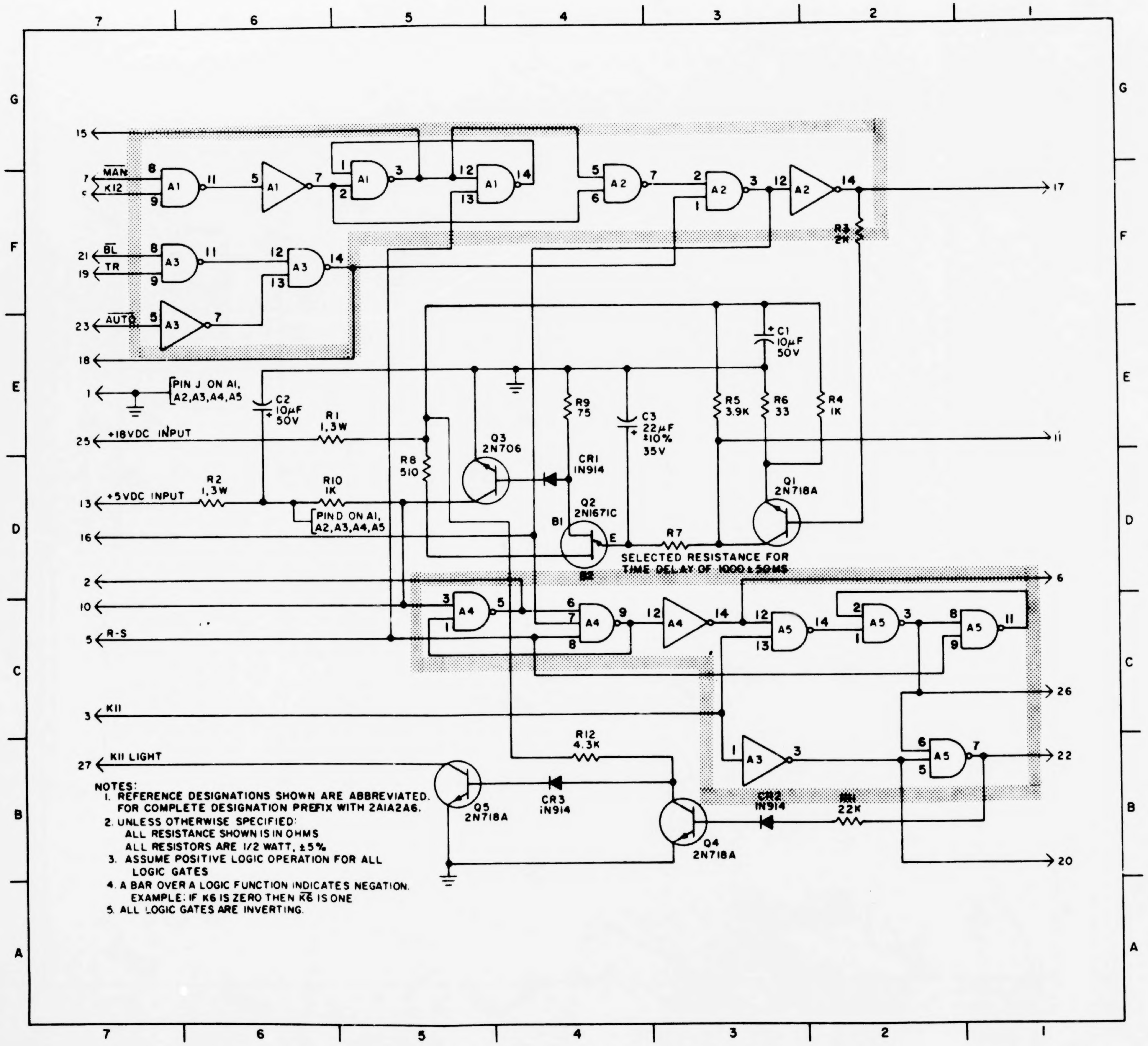

70554164
LEAD LOCATIONS
E
C
B
B2
B1
R6
Q2
R5
R2
Q1
C1
CR1
R7
Q3
A3
A4
Q5
R1
R3
R4
R11
C3
C2
R8
CR2
Q4
R9
R12
CR3
R10
A2
A1
28
1
2
3
4
5
6
7
8
9
10
11
12
13
14

REFERENCE DESIGNATION	ZONE
R1	E 5
R2	F 5
R3	F 5
R4	F 4
R5	F 4
R6	G 3
R7	F 3
R8	F 2
R9	G 1
R10	F 5
R11	E 3
R12	E 3
Q1	F 4
Q2	F 3
Q3	F 2
Q4	E 2
Q5	E 3
C1	F 3
C2	F 1
C3	F 5
CR1	F 2
CR2	E 2
CR3	E 3
A1	D 6, C 6, & D 7
A2	E 6, E 5, & E 4
A3	E 6, C 3, & C 2
A4	C 5, C 4, & B 5

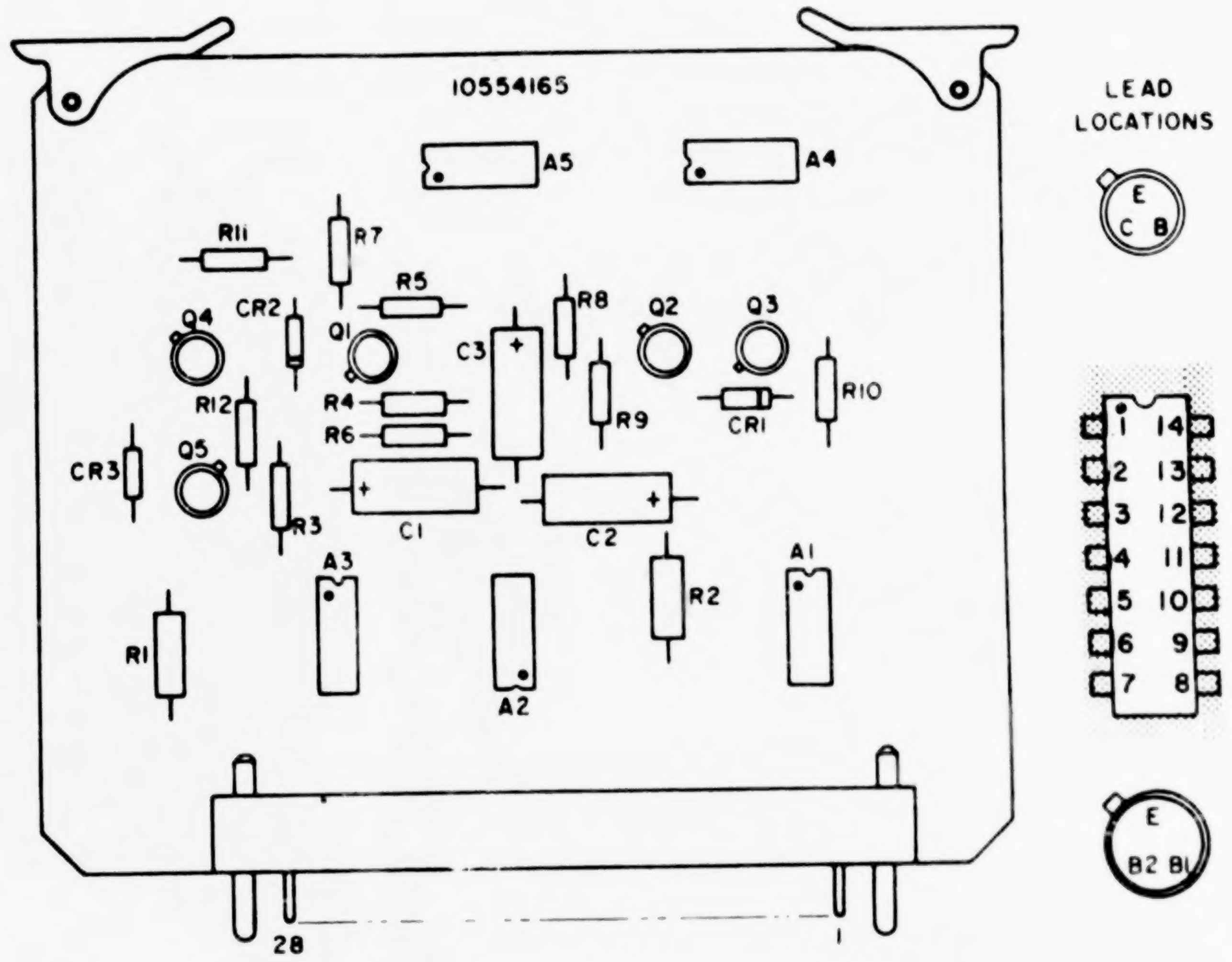
TESTOR INPUTS	TESTS & (PINS)	
	A 254	A 255
+18.4 to 19.4 VDC	45 (25)	45 (25)
+18.4 to 19.4 VDC THROUGH 1.43K	47 (27)	47 (27)
GROUND	26 (1)	26 (28)
SIGNAL GENERATOR	5, 11 (3), (9)	5 (3)
TEST 1 +2.5 to 5.0 VDC 2 GROUND	13 (11)	11 (9)
+5 VDC	30 (13)	30 (13)
GROUND RTN		13 (11)

ARR82-28649

Figure FO-18. K8 operation and sequence circuit card 2A1A2A5 (10554164), detailed schematic and component layout


15
7 MAN
K12
21 BL
19 TR
23 AUTO
18
1
PIN J ON A1, A2,A3,A4,A5
25 +18VDC INPUT
13 +5VDC INPUT
16
2
10
5 R-S
3 K11
27 K11 LIGHT
17
11
6
26
22
20
A1
A2
A3
A4
A5
C2 10μF 50V
R1 1,3W
R2 1,3W
R10 1K
PIN D ON A1, A2,A3,A4,A5
R8 510
Q3 2N706
R9 75
CR1 IN914
Q2 2N1671C
B1
B2
E
C3 22μF ±10% 35V
R7
SELECTED RESISTANCE FOR TIME DELAY OF 1000±50MS
C1 10μF 50V
R5 3.9K
R6 33
R4 1K
Q1 2N718A
R3 2K
R12 4.3K
CR3 IN914
Q5 2N718A
Q4 2N718A
CR2 IN914
R11 22K
G
F
E
D
C
B
A
7
6
5
4
3
2
1

NOTES:
1. REFERENCE DESIGNATIONS SHOWN ARE ABBREVIATED. FOR COMPLETE DESIGNATION PREFIX WITH 2A1A2A6.
2. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTANCE SHOWN IS IN OHMS
   ALL RESISTORS ARE 1/2 WATT, ±5%
3. ASSUME POSITIVE LOGIC OPERATION FOR ALL LOGIC GATES
4. A BAR OVER A LOGIC FUNCTION INDICATES NEGATION. EXAMPLE: IF K6 IS ZERO THEN $\overline{K6}$ IS ONE
5. ALL LOGIC GATES ARE INVERTING.

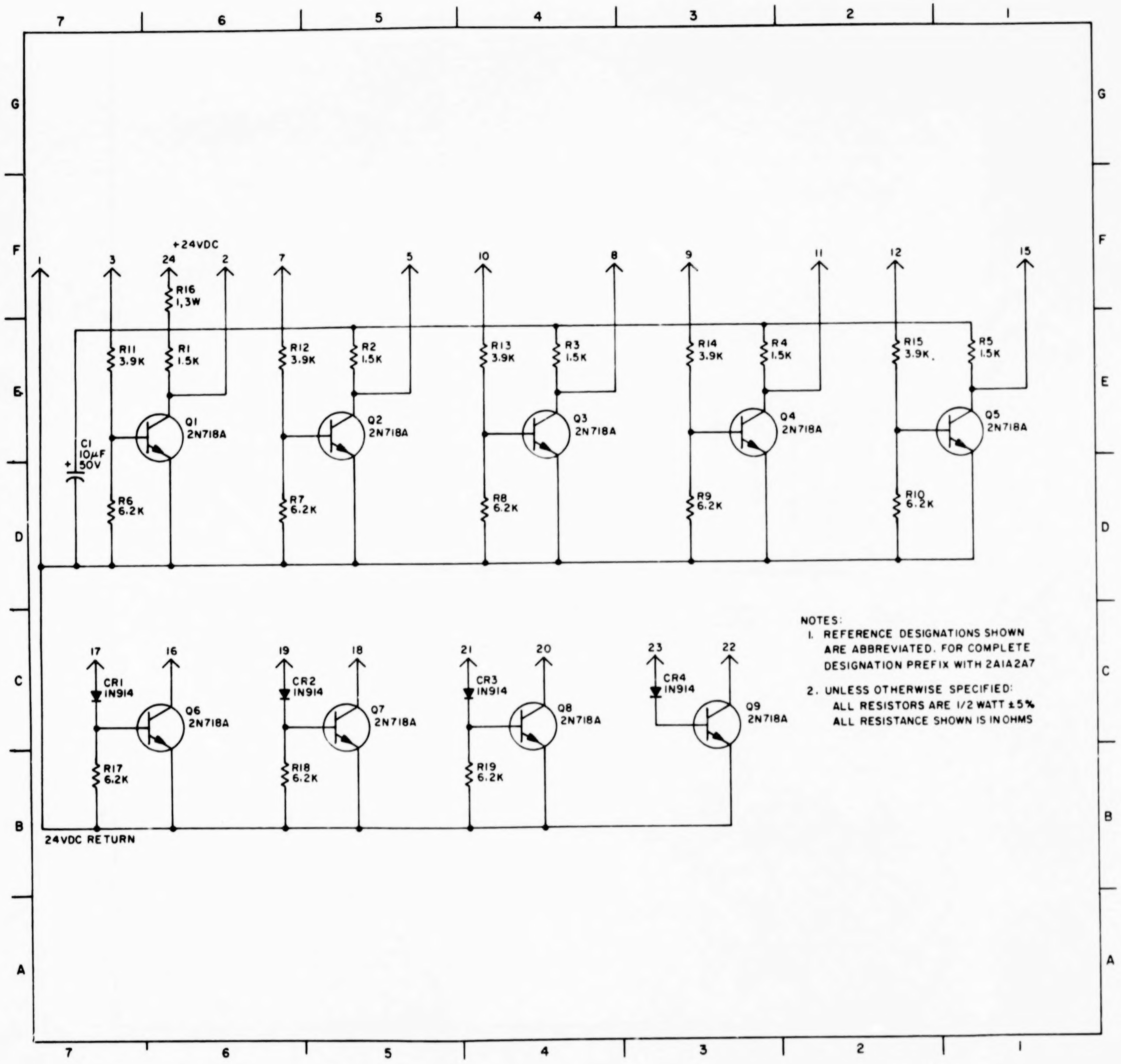

10554165
A5
A4
R11
R7
R5
R8
Q2
Q3
Q4
CR2
Q1
C3
R10
R12
R4
R6
R9
CR1
CR3
Q5
R3
C1
C2
A3
R2
A1
R1
A2
28
1
LEAD LOCATIONS
E
C
B
B2
B1
1
2
3
4
5
6
7
8
9
10
11
12
13
14

REFERENCE DESIGNATION	ZONE
R1	E-6
R2	D-6
R3	F-2
R4	E-2
R5	E-3
R6	E-3
R7	D-3
R8	F-5
R9	E-4
R10	D-5
R11	B-2
R12	B-4
Q1	D-3
Q2	D-4
Q3	D-3
Q4	B-3
Q5	B-5
C1	E-3
C2	E-6
C3	E-4
CR1	D-4
CR2	B-3
CR3	B-4
A1	F-6, F-5, & F-4
A2	F-4, F-3, & F-2
A3	F-7, F-6, E-6, & B-3
A4	C-5, C-4, & C-3
A5	C-3, C-2, C-1, & B-2

TESTOR INPUT		TEST & (PINS)	
		A 252	A 253
+18.4 to 19.4 VDC		45 (25)	45 (25)
+18.4 to 19.4 VDC THROUGH 1.43 K		47 (27)	
+5 VDC		30 (13)	30 (13)
GROUND		26 (1)	26 (1)
SIGNAL GENERATOR		5, 11 (3), (9)	9 (7)
RESET	OFF: +2.5 to 5.0 VDC ON GROUND	7 (5)	43 (23)
TEST	1: +2.5 to 5.0 VDC 2: GROUND	39, 43 (19),(23)	41 (21)

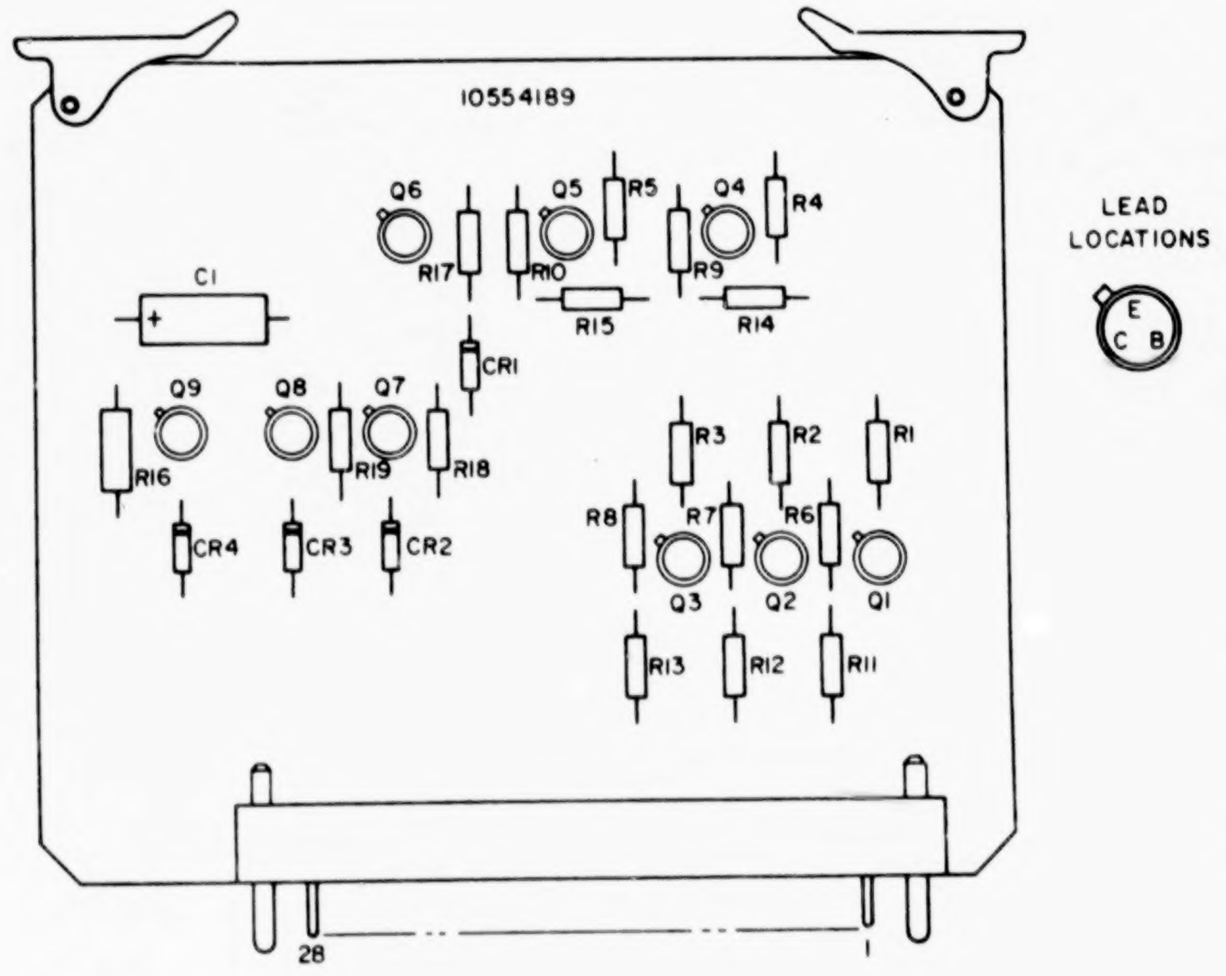
ARR82-28651

Figure FO-19. K11 operation and sequence circuit card 2A1A2A6 (10554165), detailed schematic and component layout


7
6
5
4
3
2
1
G
F
E
D
C
B
A
+24VDC
1
3
24
2
7
5
10
8
9
11
12
15
R16
1,3W
R11
3.9K
R1
1.5K
R12
3.9K
R2
1.5K
R13
3.9K
R3
1.5K
R14
3.9K
R4
1.5K
R15
3.9K
R5
1.5K
Q1
2N718A
Q2
2N718A
Q3
2N718A
Q4
2N718A
Q5
2N718A
C1
10µF
50V
+
R6
6.2K
R7
6.2K
R8
6.2K
R9
6.2K
R10
6.2K
17
16
19
18
21
20
23
22
CR1
IN914
CR2
IN914
CR3
IN914
CR4
IN914
Q6
2N718A
Q7
2N718A
Q8
2N718A
Q9
2N718A
R17
6.2K
R18
6.2K
R19
6.2K
24VDC RETURN

NOTES:

1. REFERENCE DESIGNATIONS SHOWN ARE ABBREVIATED. FOR COMPLETE DESIGNATION PREFIX WITH 2A1A2A7
2. UNLESS OTHERWISE SPECIFIED: ALL RESISTORS ARE 1/2 WATT ±5% ALL RESISTANCE SHOWN IS IN OHMS

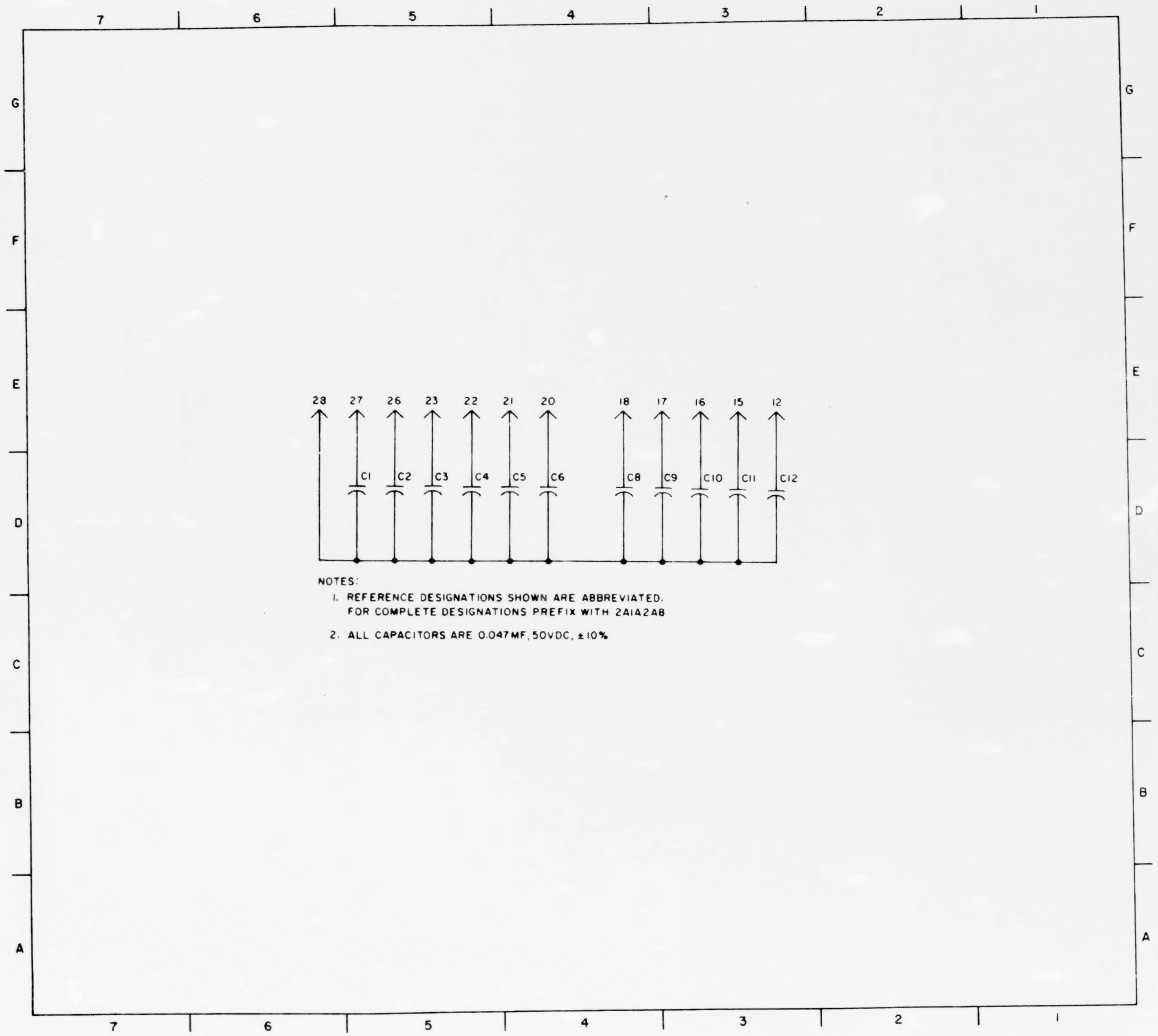

10554189
Q6
R17
R10
Q5
R5
Q4
R4
R9
C1
+
R15
R14
CR1
Q9
Q8
Q7
R16
R19
R18
CR4
CR3
CR2
R3
R2
R1
R8
R7
R6
Q3
Q2
Q1
R13
R12
R11
28
1
LEAD LOCATIONS
E
C
B

REFERENCE DESIGNATION	ZONE	REFERENCE DESIGNATION	ZONE
R1	E-6	R18	B-6
R2	E-5	R19	B-4
R3	E-4	Q1	E-6
R4	E-3	Q2	E-5
R5	E-1	Q3	E-4
R6	D-7	Q4	E-3
R7	D-6	Q5	E-1
R8	D-4	Q6	C-6
R9	D-3	Q7	C-5
R10	D-2	Q8	C-4
R11	E-7	Q9	C-3
R12	E-6	C1	D-7
R13	E-4	CR1	C-7
R14	E-3	CR2	C-6
R15	E-2	CR3	C-4
R16	F-6	CR4	C-3
R17	B-7		

TESTOR INPUT	TEST AND (PINS)				
	B1	B2	B3	B4	B5
+24.5 to +25.5 VDC	44 (24)				
GROUND	26 (1)	26 (1)	26 (1)	26 (1)	26 (1)
SIGNAL GENERATOR	5,9,11,12,14 (3),(7),(9),(10),(12)				
+22 to 28 VDC THROUGH MATRIX 2 + 1.1K		18 (16)	38 (18)	40 (20)	42 (22)
SIGNAL GENERATOR THROUGH MATRIX 1 + 1.1K		19 (17)	39 (19)	41 (21)	43 (23)

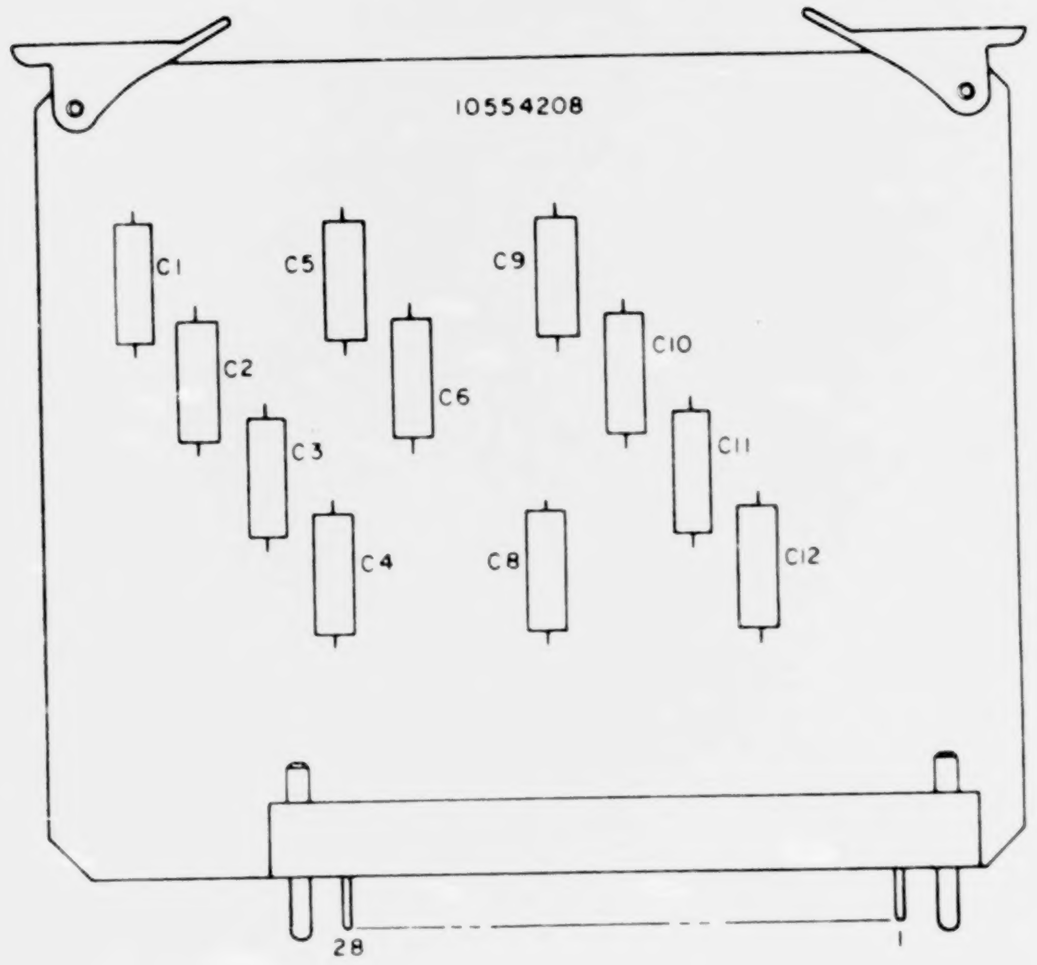
AR904847

FO-20. Relay time circuit card 2A1A2A7 (10554189), detailed schematic and component layout


7
6
5
4
3
2
1
G
F
E
D
C
B
A
28
27
26
23
22
21
20
18
17
16
15
12
C1
C2
C3
C4
C5
C6
C8
C9
C10
C11
C12

NOTES:

1. REFERENCE DESIGNATIONS SHOWN ARE ABBREVIATED. FOR COMPLETE DESIGNATIONS PREFIX WITH 2A1A2A8
2. ALL CAPACITORS ARE 0.047MF, 50VDC, ±10%

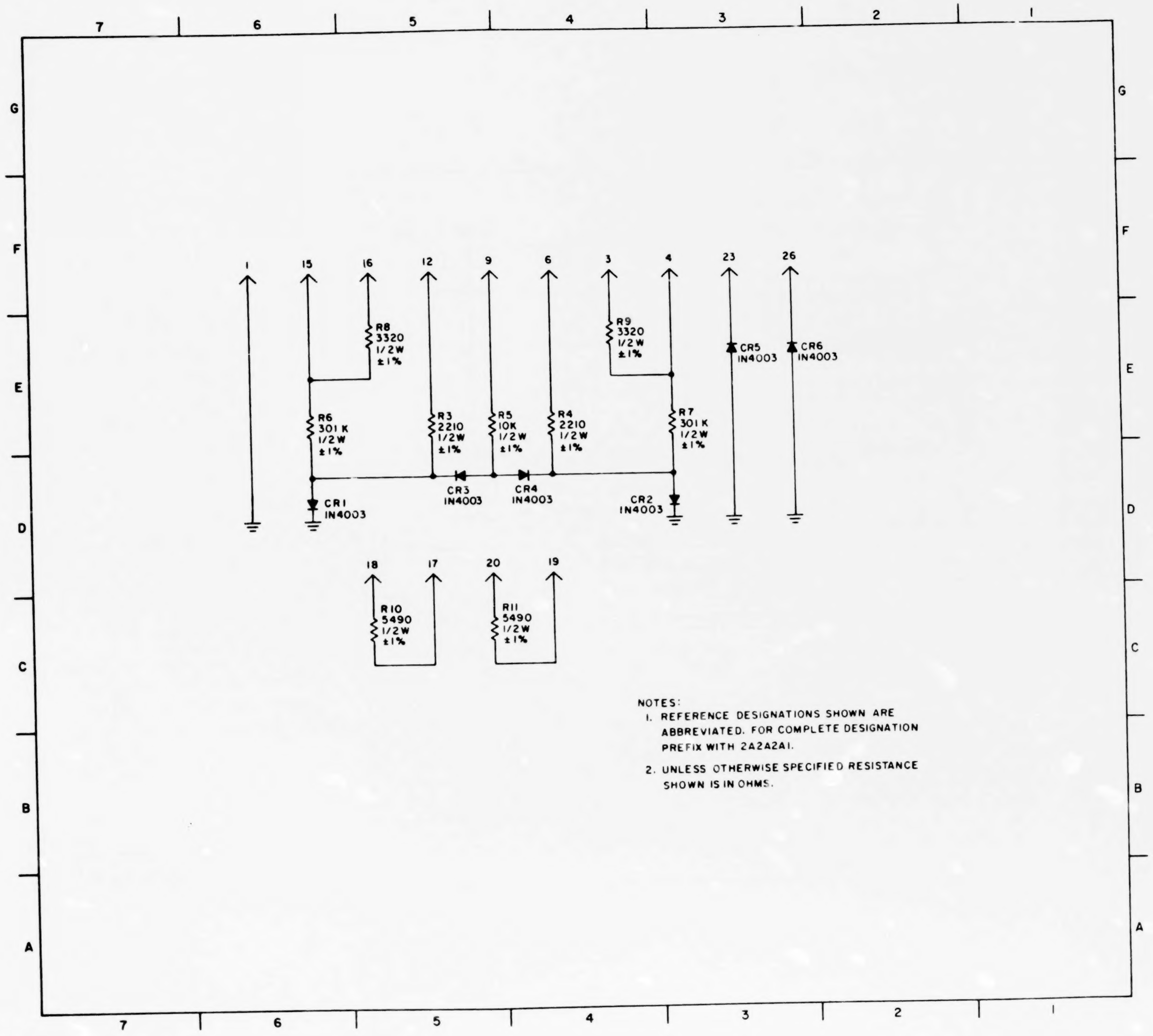

10554208
C1
C2
C3
C4
C5
C6
C8
C9
C10
C11
C12
28
1

REFERENCE DESIGNATION	ZONE
C1	D 5
C2	D 5
C3	D 5
C4	D 5
C5	D 4
C6	D 4
C8	D 4
C9	D 3
C10	D 3
C11	D 3
C12	D 3

TESTOR INPUTS	TESTS AND (PINS)					
	B159	B160	B161	B162	B163	B164
SIGNAL GENERATOR THROUGH MATRIX 1 + 50	17 (15)	19 (17)	40 (20)	41 (21)	43 (23)	47 (27)
SIGNAL GENERATOR THROUGH MATRIX 2 + 50	14 (12)	18 (16)	38 (18)	42 (22)	46 (26)	
GROUND	24 (28)	24 (28)	24 (28)	24 (28)	24 (28)	24 (28)

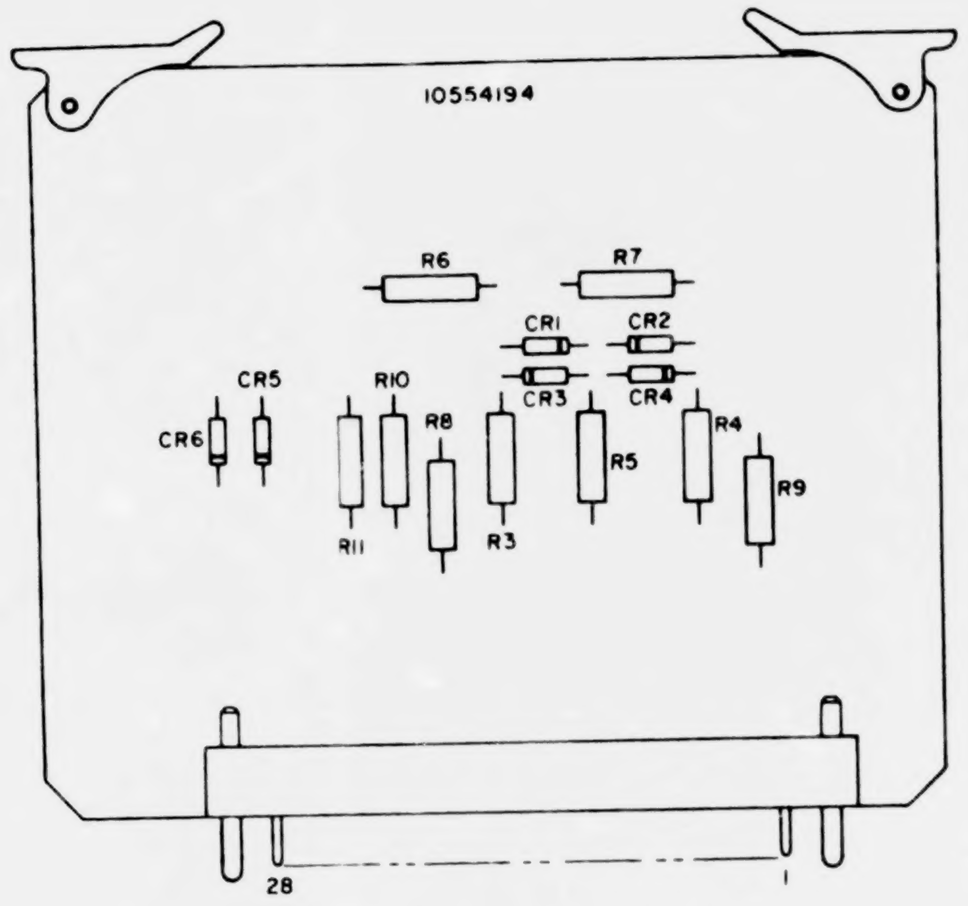
AR905232

FO-21. Noise suppression circuit card 2A1A2A8 (10554208), detailed schematic and component layout


7
6
5
4
3
2
1
G
F
E
D
C
B
A
1
15
16
12
9
6
3
4
23
26
R8
3320
1/2W
±1%
R9
3320
1/2W
±1%
CR5
IN4003
CR6
IN4003
R6
301 K
1/2W
±1%
R3
2210
1/2W
±1%
R5
10K
1/2W
±1%
R4
2210
1/2W
±1%
R7
301 K
1/2W
±1%
CR1
IN4003
CR3
IN4003
CR4
IN4003
CR2
IN4003
18
17
20
19
R10
5490
1/2W
±1%
R11
5490
1/2W
±1%

NOTES:

1. REFERENCE DESIGNATIONS SHOWN ARE ABBREVIATED. FOR COMPLETE DESIGNATION PREFIX WITH 2A2A2A1.
2. UNLESS OTHERWISE SPECIFIED RESISTANCE SHOWN IS IN OHMS.

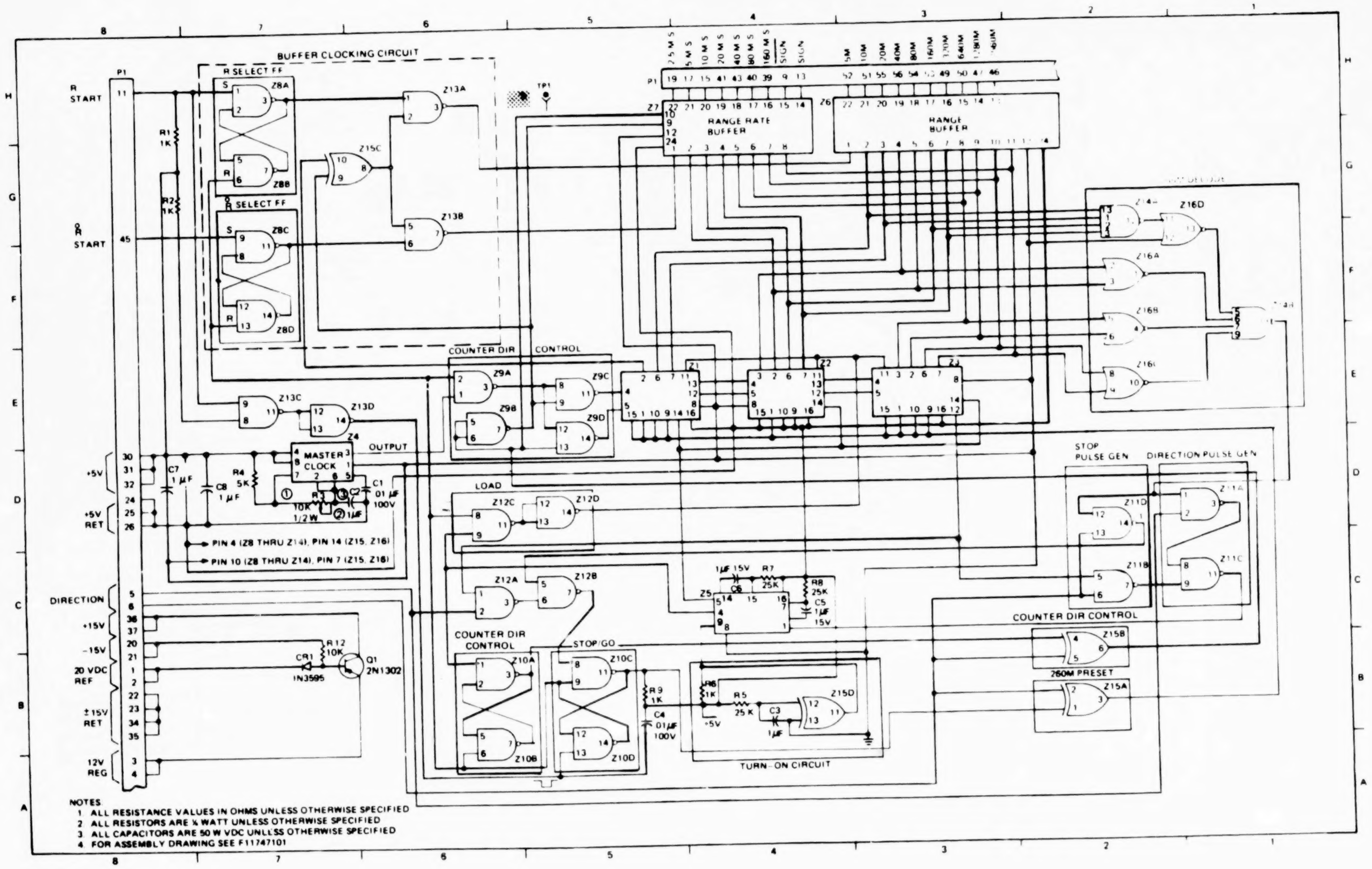

10554194
R6
R7
CR1
CR2
CR3
CR4
CR5
CR6
R10
R8
R11
R3
R5
R4
R9
28
1

REFERENCE DESIGNATION	ZONE
R3	E-5
R4	E-4
R5	E-5
R6	E-6
R7	E-3
R8	E-5
R9	E-4
R10	C-5
R11	C-5
CR1	D 6
CR2	D-3
CR3	D-5
CR4	D 4
CR5	E-3
CR6	E 3

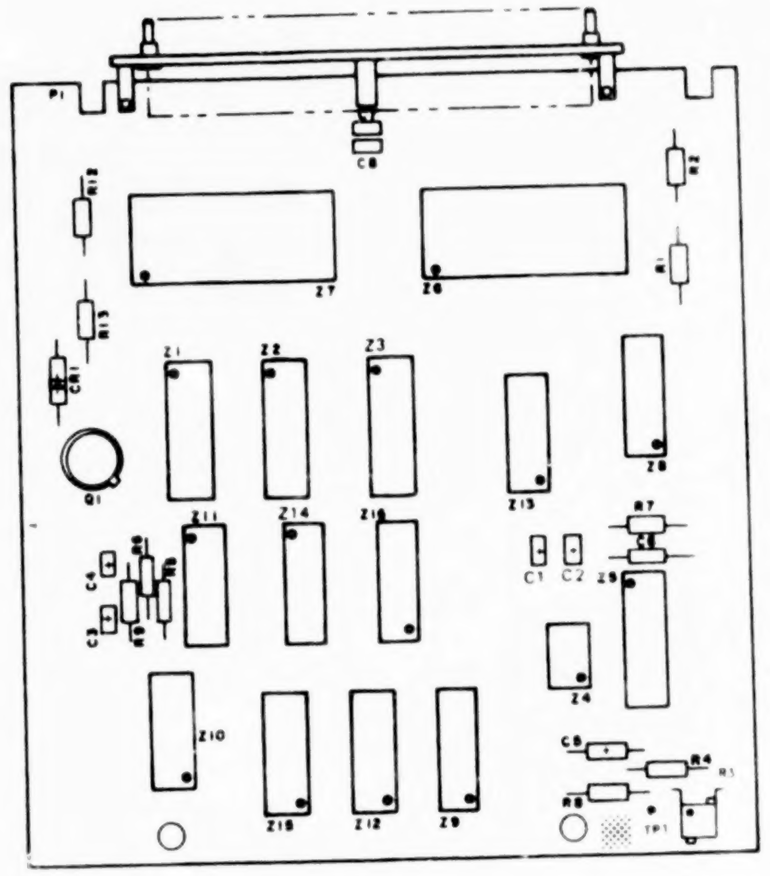
TESTOR INPUTS	TESTS AND (PINS)				
	B26	B27	B28	B29	B37
+14 2 to 15 2 VDC THROUGH 2 1K	8, 14 (6), (12)				
GROUND	24 (1)	24, 11 (1), (9)	24, 11 (1), (9)	24, 8, 14 (1), (6), (12)	10, 24 (1), (8)
–14 8 to –15 2 VDC THROUGH 2 1K		8, 43 (6), (23)	14, 46 (12), (26)		
–14 8 to –15 2 VDC THROUGH 12 1K				11 (9)	
SIGNAL GENERATOR					12, 47 (10), (27)

AR904846A

FO-22. Servo amplifier circuit card 2A2A2A1 (11758031), detailed schematic and component layout.


BUFFER CLOCKING CIRCUIT
R SELECT FF
Ṙ SELECT FF
R START
Ṙ START
P1
R1 1K
R2 1K
Z8A
Z8B
Z8C
Z8D
Z15C
Z13A
Z13B
Z13C
Z13D
TP1
RANGE RATE BUFFER
RANGE BUFFER
Z7
Z6
SIGN
COUNTER DIR CONTROL
Z9A
Z9B
Z9C
Z9D
Z1
Z2
Z3
Z16A
Z16B
Z16C
Z16D
MASTER CLOCK
Z4
OUTPUT
+5V
+5V RET
C7 1 µF
C8 1 µF
R4 5K
C1 .01 µF 100V
R3 10K 1/2W
C2 1 µF
PIN 4 (Z8 THRU Z14), PIN 14 (Z15, Z16)
PIN 10 (Z8 THRU Z14), PIN 7 (Z15, Z16)
LOAD
Z12A
Z12B
Z12C
Z12D
DIRECTION
+15V
-15V
20 VDC REF
±15V RET
12V REG
R12 10K
CR1 1N3595
Q1 2N1302
STOP PULSE GEN
DIRECTION PULSE GEN
Z11A
Z11B
Z11C
Z11D
Z5
C6 1µF 15V
R7 25K
R8 25K
C5 1µF 15V
COUNTER DIR CONTROL
STOP/GO
Z10A
Z10B
Z10C
Z10D
R9 1K
C4 .01µF 100V
R6 1K
R5 25K
C3 1µF
+5V
Z15A
Z15B
Z15D
260M PRESET
TURN-ON CIRCUIT

NOTES
1 ALL RESISTANCE VALUES IN OHMS UNLESS OTHERWISE SPECIFIED
2 ALL RESISTORS ARE ¼ WATT UNLESS OTHERWISE SPECIFIED
3 ALL CAPACITORS ARE 50 W VDC UNLESS OTHERWISE SPECIFIED
4 FOR ASSEMBLY DRAWING SEE F11747101

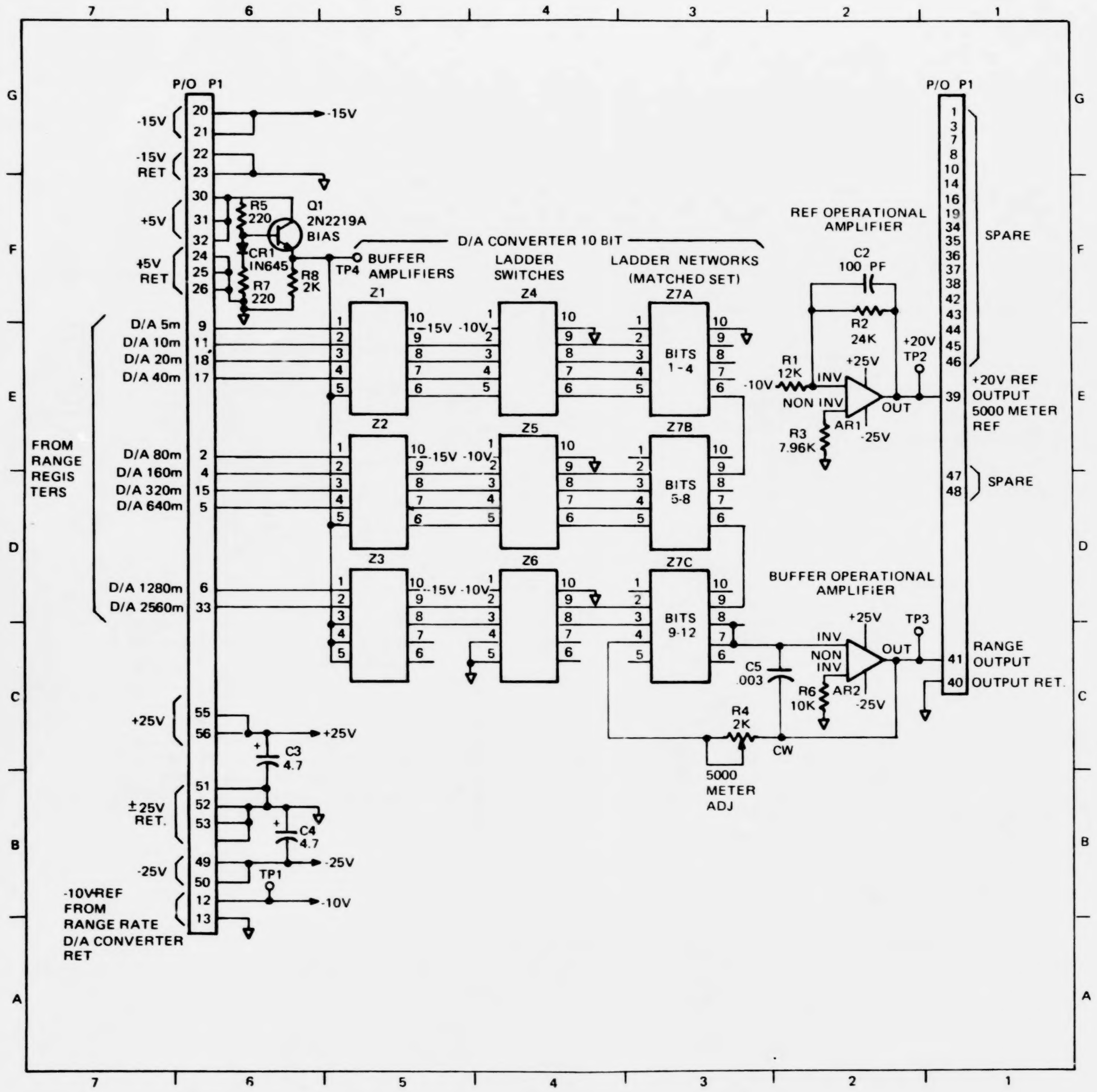

P1
C8
R2
R1
R13
CR1
Z7
Z6
Z1
Z2
Z3
Q1
Z11
Z14
Z16
Z13
Z8
R7
C6
C1
C2
Z5
Z4
Z10
Z15
Z12
Z9
R8
R4
TP1

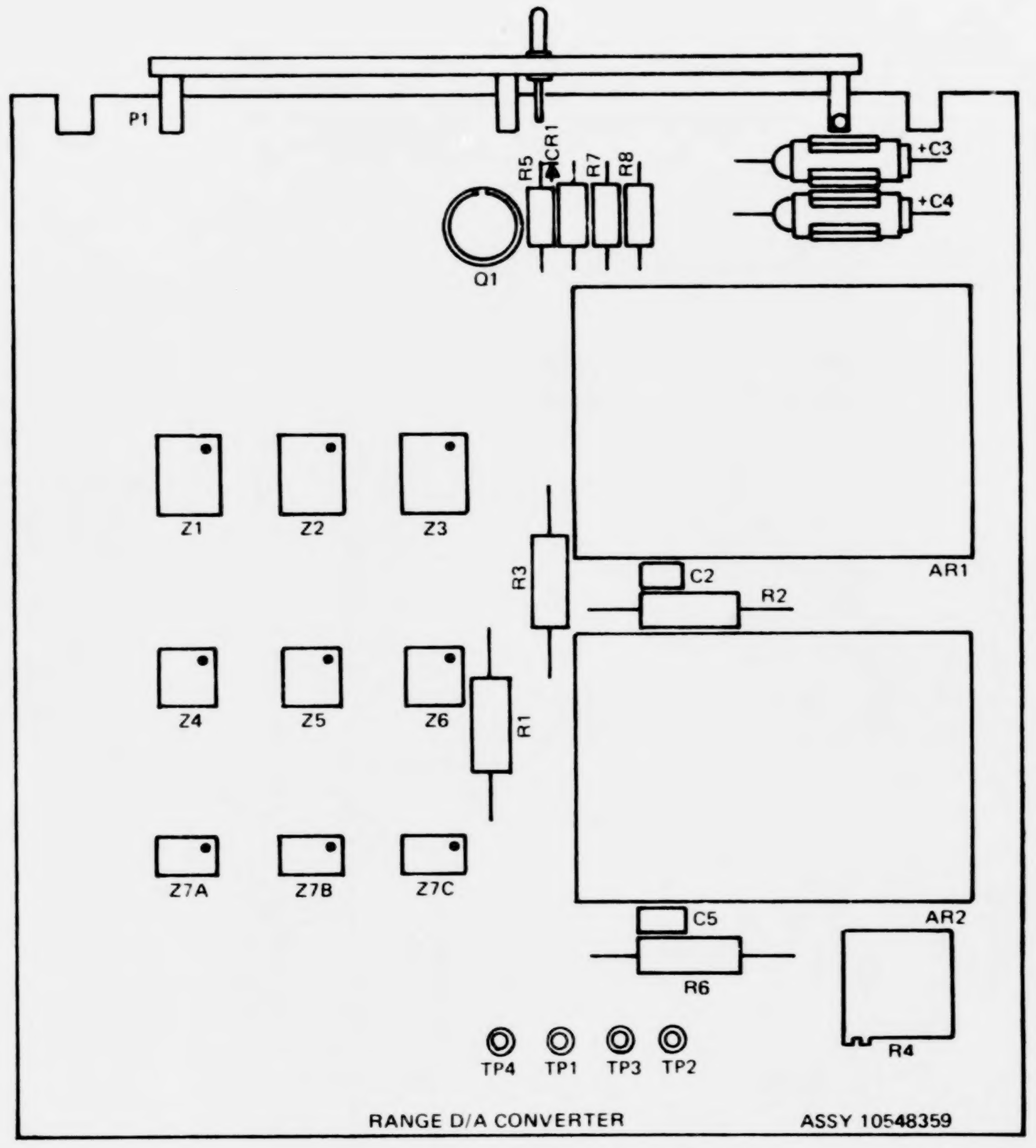
REFERENCE DESIGNATION	ZONE	REFERENCE DESIGNATION	ZONE	REFERENCE DESIGNATION	ZONE
C1	D 6	Z3	E 3	Z13A	H 6
C2	D 7	Z4	D 7	Z13B	G 6
C3	B 4	Z5	C 4	Z13C	E 7
C4	B 5	Z6	H 3	Z13D	E 7
C5	C 4	Z7	H 4	Z14A	G 2
C6	C 4	Z8A	H 7	Z14B	E 1
C7	D 8	Z8B	G 7	Z15A	B 2
C8	D 7	Z8C	F 7	Z15B	B 2
CR1	B 7	Z8D	F 7	Z15C	G 7
Q1	B 7	Z9A	E 6	Z15D	B 4
R1	H 8	Z9B	E 6	Z16A	F 2
R2	G 8	Z9C	E 5	Z16B	F 2
R3	D 7	Z9D	E 5	Z16C	E 2
R4	D 7	Z10A	B 6	Z16D	F 1
R5	B 4	Z10B	A 6		
R6	B 4	Z10C	B 5		
R7	C 4	Z10D	A 5		
R8	C 4	Z11A	D 1		
R9	B 5	Z11B	C 2		
		Z11C	C 1		
		Z11D	D 2		
R12	B 7	Z12A	C 6		
TP1	H 5	Z12B	C 5		
Z1	E 5	Z12C	D 6		
Z2	E 4	Z12D	D 5		

TESTER INPUTS	TEST AND PINS	
	A65	A66
+5 VDC	30 31 32	30 31 32
+15 VDC		36 37
-15 VDC		20 21
+20 VDC		1 2
RESET ON -0.8 TO +4.0 VDC OFF +2.0 TO +5.5 VDC	11	
RESET ON -0.8 TO +4.0 VDC OFF +2.0 TO +5.5 VDC		45
TEST 1 +2.0 TO +5.5 VDC 2 -0.8 TO $0.3 VDC	5	5
TEST 1 +2.0 TO +5.5 VDC 2 -0.8 TO +4.0 VDC	6	6

ARR82-28650

Figure FO-23. Range and range rate generator circuit card 2A2A6A1 (11747101), detailed schematic and component layout.


P/O P1
-15V
-15V RET
+5V
+5V RET
Q1 2N2219A BIAS
R5 220
CR1 IN645
R7 220
R8 2K
TP4
D/A CONVERTER 10 BIT
BUFFER AMPLIFIERS
LADDER SWITCHES
LADDER NETWORKS (MATCHED SET)
Z1
Z2
Z3
Z4
Z5
Z6
Z7A
Z7B
Z7C
BITS 1-4
BITS 5-8
BITS 9-12
D/A 5m
D/A 10m
D/A 20m
D/A 40m
FROM RANGE REGIS TERS
D/A 80m
D/A 160m
D/A 320m
D/A 640m
D/A 1280m
D/A 2560m
-15V -10V
REF OPERATIONAL AMPLIFIER
C2 100 PF
R2 24K
R1 12K
-10V
INV
NON INV
OUT
AR1
R3 7.96K
+25V
-25V
+20V TP2
SPARE
+20V REF OUTPUT 5000 METER REF
SPARE
BUFFER OPERATIONAL AMPLIFIER
C5 .003
R6 10K
AR2
TP3
RANGE OUTPUT
OUTPUT RET.
R4 2K
CW
5000 METER ADJ
+25V
C3 4.7
±25V RET.
C4 4.7
-25V
TP1
-10V REF FROM RANGE RATE D/A CONVERTER RET
-10V


P1
R5
CR1
R7
R8
+C3
+C4
Q1
Z1
Z2
Z3
AR1
R3
C2
R2
Z4
Z5
Z6
R1
Z7A
Z7B
Z7C
C5
AR2
R6
R4
TP4
TP1
TP3
TP2
RANGE D/A CONVERTER
ASSY 10548359

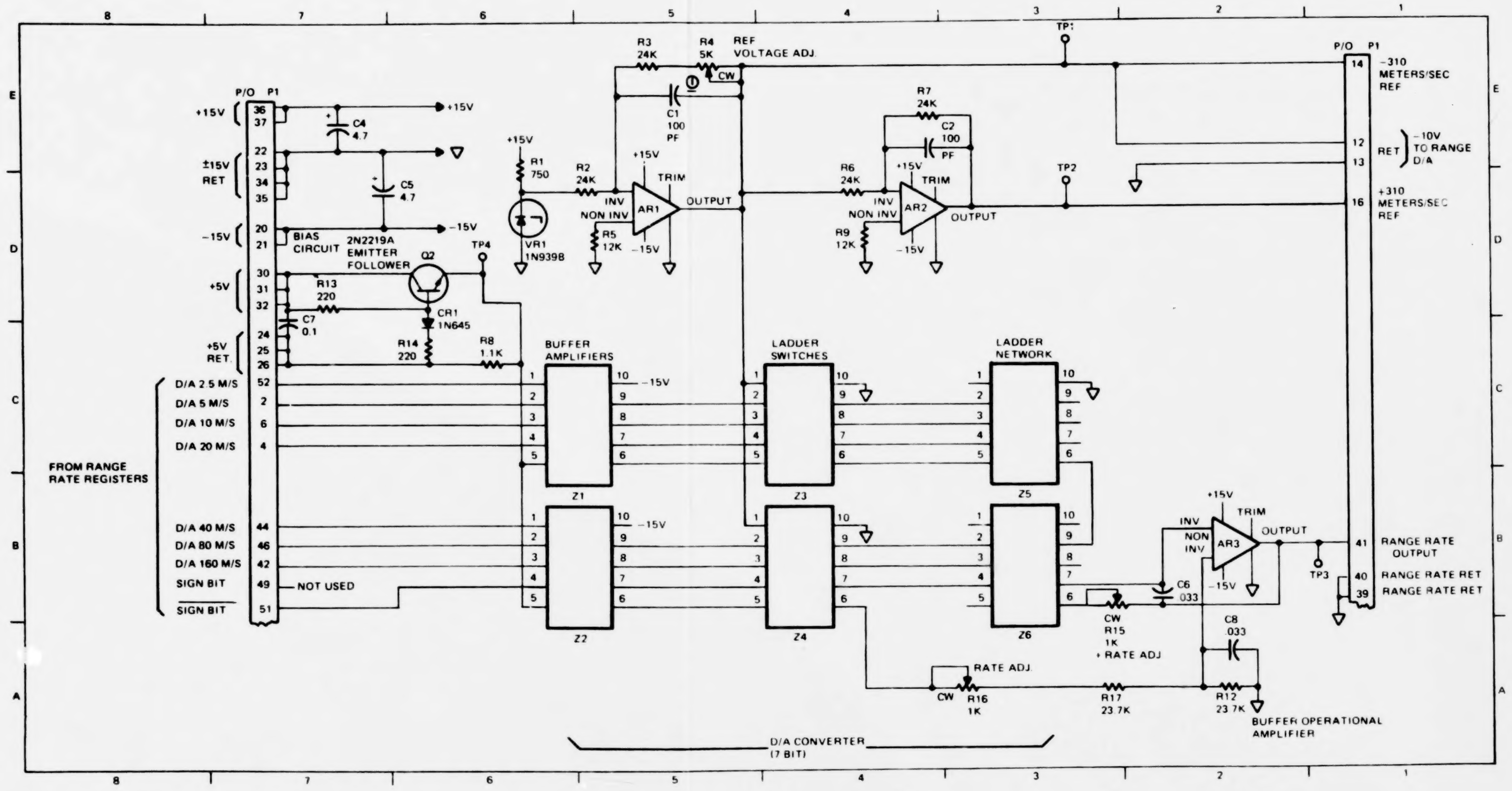
REFERENCE DESIGNATION	ZONE	REFERENCE DESIGNATION	ZONE	REFERENCE DESIGNATION	ZONE	REFERENCE DESIGNATION	ZONE
AR1	E-2	R7	F-6	Z5	D-4		
AR2	C-2	R8	F-6		E-4		
C2	F-2	TP1	B-6	Z6	C-4		
C3	C-6	TP2	E-2		D-4		
C4	B-6	TP3	C-2	Z7A	E-3		
C5	C-2	RP4	F-5		F-3		
CR1	F-6	Z1	E-5	Z7B	D-3		
Q1	F-6		F-5		E-3		
R1	E-2	Z2	D-5	Z7C	C-3		
R2	F-2		E-5		D-3		
R3	E-2	Z3	C-5				
R4	C-3		D-5				
R5	F-6	Z4	E-4				
R6	C-2		F-4				

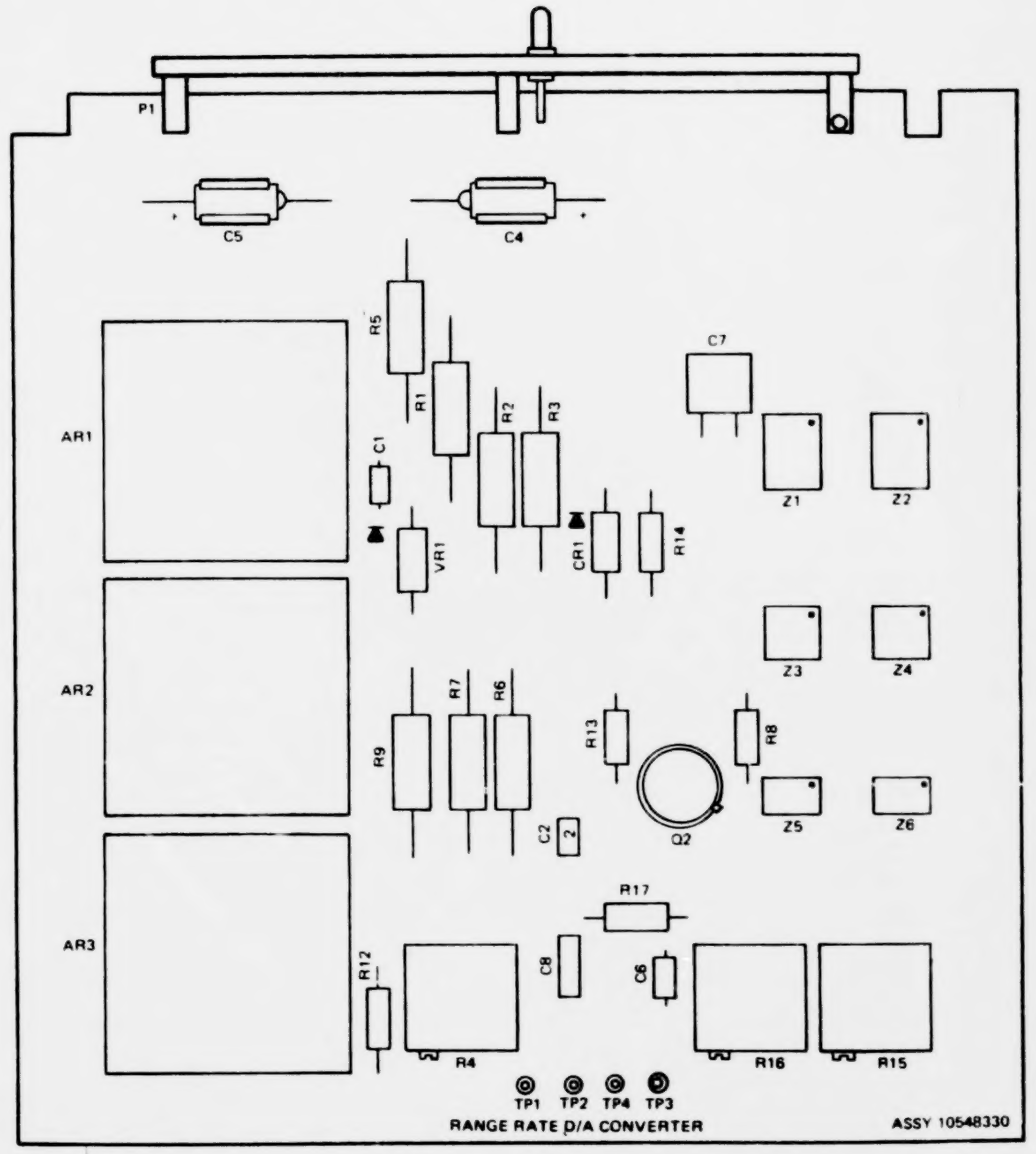
TESTER INPUTS		TEST AND(PINS)
		A30
-15 VDC		20, 21
+5 VDC		30, 31, 32
+25 VDC		55, 56
-25 VDC		49, 50
RESET	ON: -0.8 to +0.4 VDC OFF: +2.0 to +5.5 VDC	2
TEST	1: +2.0 to +5.5 VDC 2: -0.8 to +0.4 VDC	4
TEST	1: +2.0 to +5.5 VDC 2: -0.8 to +0.4 VDC	5

TESTER INPUTS		TESTS AND (PINS)
		A30
TEST	1: +2.0 to +5.5 VDC 2: -0.8 to +0.4 VDC	6
RESET	ON: -0.8 to +0.4 VDC OFF: +2.0 to +5.5 VDC	9
RESET	ON: -0.8 to +0.4 DC OFF: +2.0 to +5.5 VDC	11
TEST	1: +2.0 to +5.5 VDC 2: -0.8 to +0.4 VDC	15
TEST	1: +2.0 to +5.5 VDC 2: -0.8 to +0.4 VDC	17
RESET	ON: -0.8 to +0.4 VDC OFF +2.0 to +5.5 VDC	18
TEST	1: +2.0 to +5.5 VDC 2: -0.8 to +0.4 VDC	33

AR918180

FO-24. Range D/A converter circuit card 2A2A6A2 (10548359), detailed schematic and component layout.


8
7
6
5
4
3
2
1
E
D
C
B
A
P/O P1
+15V
36
37
C4
4.7
+15V
±15V
RET
22
23
34
35
C5
4.7
−15V
20
21
BIAS
CIRCUIT
2N2219A
EMITTER
FOLLOWER
Q2
TP4
+5V
30
31
32
R13
220
CR1
1N645
C7
0.1
+5V
RET.
24
25
26
R14
220
R8
1.1K
D/A 2.5 M/S
D/A 5 M/S
D/A 10 M/S
D/A 20 M/S
FROM RANGE
RATE REGISTERS
D/A 40 M/S
D/A 80 M/S
D/A 160 M/S
SIGN BIT
SIGN BIT
52
2
6
4
44
46
42
49
51
NOT USED
+15V
R1
750
VR1
1N9398
R2
24K
R3
24K
R4
5K
REF
VOLTAGE ADJ.
CW
C1
100
PF
+15V
TRIM
INV
NON INV
AR1
OUTPUT
R5
12K
−15V
BUFFER
AMPLIFIERS
10
−15V
Z1
Z2
LADDER
SWITCHES
Z3
Z4
LADDER
NETWORK
Z5
Z6
TP1
R7
24K
C2
100
PF
R6
24K
+15V
TRIM
INV
NON INV
AR2
OUTPUT
R9
12K
−15V
TP2
P/O P1
14
−310
METERS/SEC
REF
12
13
RET
−10V
TO RANGE
D/A
16
+310
METERS/SEC
REF
+15V
TRIM
INV
NON
INV
AR3
OUTPUT
−15V
C6
.033
CW
R15
1K
+ RATE ADJ
C8
.033
RATE ADJ.
CW
R16
1K
R17
23.7K
R12
23.7K
BUFFER OPERATIONAL
AMPLIFIER
TP3
41
RANGE RATE
OUTPUT
40
RANGE RATE RET
39
RANGE RATE RET
D/A CONVERTER
(7 BIT)


P1
C5
C4
R5
R1
R2
R3
C7
AR1
C1
VR1
CR1
R14
Z1
Z2
AR2
R9
R7
R6
R13
R8
Z3
Z4
C2
Q2
Z5
Z6
R17
AR3
R12
C8
C6
R4
R16
R15
TP1
TP2
TP4
TP3
RANGE RATE D/A CONVERTER
ASSY 10548330

REFERENCE DESIGNATION	ZONE	REFERENCE DESIGNATION	ZONE	REFERENCE DESIGNATION	ZONE	REFERENCE DESIGNATION	ZONE
AR1	D-5	R3	E-5	TP2	D-3		
AR2	D-4	R4	E-5	TP3	B-1		
AR3	B-2	R5	D-5	TP4	D-6		
C1	E-5	R6	D-4	VR1	D-6		
C2	E-4	R7	E-4	Z1	C-6 C-5		
C4	E-7	R8	C-6				
C5	D-7	R9	D-4	Z2	B-5 B-6		
C6	B-2	R12	A-2				
C7	C-7	R13	D-7	Z3	C-4		
C8	A-2	R14	C-6	Z4	B-4		
CR1	C-6	R15	B-3	Z5	C-3		
Q2	D-6	R16	A-3	Z6	B-3		
R1	D-6	R17	A-3				
R2	D-5	TP1	E-3				

TESTER INPUTS	TEST AND PINS
	A31
+15 VDC	36, 37
−15 VDC	20, 21
+5 VDC	30, 31, 32
TEST 1: +2.0 TO 5.5 VDC 2: −0.8 TO −0.4 VDC	2
RESET ON: −0.8 TO +0.4 VDC OFF: +2.0 TO +5.5 VDC	4
RESET ON: +2.0 TO +5.5 VDC OFF: −0.8 TO 0.4 VDC	6
RESET ON: −0.8 TO +0.4 VDC OFF: +2.0 TO +5.5 VDC	42

TESTER INPUTS	TEST AND PINS
	A31
RESET ON: −0.8 TO +0.4 VDC OFF: +2.0 TO +5.5 VDC	44
RESET ON: −0.8 TO +0.4 VDC OFF: +2.0 TO +5.5 VDC	46
TEST 1: +2.0 TO +5.5 VDC 2: −0.8 TO 0.4 VDC	51
TEST 1: +2.0 TO +5.5 VDC 2: −0.8 TO +0.4 VDC	52

AR918181

FO-25. Range rate D/A converter circuit card 2A2A6A3 (10548330), detailed schematic and component layout.